U.S. NAVAL BASE, PEARL HARBOR, BAKER DOCKS B-11 TO B-21 HAER No. HI-10
(U.S. Naval Base, Pearl Harbor, Naval Station)
(Wharfs, Bravo Docks B-11 to B-21)
North of Pearl Harbor Shipyard
Pearl Harbor
Honolulu County
Hawaii

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
U.S. Department of the Interior
National Park Service
Oakland, California

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HAER No. HI-10

Location: Pearl Harbor waterfront
Pearl Harbor Naval Base
City and County of Honolulu, Hawaii

U.S.G.S. Pearl Harbor Quadrangle, Hawaii, 1999
7.5 Minute Series (Topographic) (Scale – 1:24,000)
Universal Transverse Mercator Coordinates:

B-11	04.608640.2361880	B-12	04.608640.2361830
B-13	04.608540.2361660	B-14	04.608520.2361570
B-15	04.608620.2361630	B-16	04.608700.2361760
B-17	04.608730.2361740	B-18	04.608650.2361610
B-19	04.608630.2361500	B-20	04.608710.2361540
		B-21	04.608790.2361660

Date of Construction: 1935

Designer: U.S. Navy Bureau of Yards and Docks, Naval Station Pearl Harbor

Builders: Hawaiian Dredging Co. Ltd., Grace Bros. Ltd.

Owner: United States Navy

Present Use: Repair basins.

Significance: Wharfs No. B-11 to B-21 are located within the Pearl Harbor Historic Landmark. These wharfs are significant for their association with the buildup of facilities at Pearl Harbor prior to WWII. The wharfs were extant and in use during the Japanese attack of December 7, 1941 which officially brought the United States into the war. The ships in the repair basins bordered by these wharfs were targets of the attackers, and many of the ships as well as areas of the wharfs themselves, were damaged during the attack.

Prepared by: Dee Ruzicka
Architectural Historian
Mason Architects, Inc.
119 Merchant Street, Suite 501
Honolulu, HI 96813

Date of Report: January 2010

Description:

Wharfs Nos. B-11 to B-21 are constructed of reinforced concrete and border two of the repair basins in Pearl Harbor Naval Shipyard. The wharfs form a W-shaped plan, with parallel sides and center member. The open top of the W is oriented to the northeast. The wharfs define the shipyard's west repair and east repair basins.[1] Numbering of the docks begins at the northwest side, with B-11, and follows sequentially around the two repair basins, ending at B-21 at the southeast.

B-11 is an approximately 450' long section at the west edge of the west pier. The east edge of this pier is about 1230' long and is designated as B-12 at the end of the pier (north) and B-13 at the base of the pier (south). B-14 is the section of wharf at the base (southwest) of the west basin, between the west pier and the middle pier. The middle pier is about 1150' long and is designated on its west edge at the base of the pier as B-15 and B-16 at the end of the pier. On the east edge, the middle pier is designated B-17 at its end, and B-18 at its base. B-19 is the wharf at the base of the east basin, between the middle pier and the east quay. The east quay is about 900' long and has B-20 at its base and B-21 at its end. Each of the piers is about 100' wide. The docks that are built at quays (B-13, B-14, B-19, B-20, and B-21) are of varying widths, from about 37' to 64' wide.

The piers are typically built on reinforced concrete columns (called cylinder piles on 1947 repair drawings) which are set into the harbor bottom.[2] These columns are shown on construction drawings with 6" thick concrete walls reinforced with 1" vertical steel bars and ½" diameter steel reinforcing that is spiral wrapped with a 6" pitch.[3] The lower ends of the columns are shown flared. This flaring begins about 12'-6" from the bottom end of the column, and expands to a diameter of about 14'-3" at the bottom end. These flared ends rest on driven piles which penetrate down into the harbor floor. Typically the piers are constructed with four of these columns in a transverse bent with a spacing of about 28'-0" on centers between the columns and 24'-0" on centers between the bents. The sides of the pier deck at the outboard edges over hang the outside columns by about 7'-6" on each side. The two inner columns in each bent are shown on drawings with a diameter of 4'-0" and the two outer columns with a diameter of 3'-9".[4]

Each transverse bent of columns is capped by a reinforced concrete beam about 4'-9" high which provides support for the longitudinal concrete beams and the approximately 8" thick reinforced concrete deck. The section of the deck overhanging the outboard edges is about 12" thick. The deck is at a level of 12'-3" above the mean low water line and has a 14" wide, 9" high concrete curb at its edge. Longitudinal support for the pier deck is provided by a 4'-0" high 1'-7" thick reinforced concrete beam that is located at the center of the pier and by 3'-0" high beams which are tapered; 1'-9" wide at the bottom and 5'-6" wide at the top where they meet the underside of the deck.[5] These tapered longitudinal beams are where the 3'-0" gauge railroad tracks are set into the deck which serve the docks.[6] The railroad tracks typically run along the

[1] NAVFAC drawing I-N15-304, July 9, 1937.
[2] NAVFAC drawing I-N15-631, August 18, 1947.
[3] NAVFAC drawing 122470, January 29, 1936.
[4] NAVFAC drawing 116944, September 9, 1933.
[5] NAVFAC drawing 116944, September 9, 1933.
[6] NAVFAC drawing 116951, September 9, 1933.

docks at a distance of about 15'-6" from the outboard edge. Some areas of the docks have double tracks, located at 15'-6" and at 27'-9" from the edge of the pier.[7]

At the former location of the hammerhead crane, about 264'-0" from the end of the pier at wharf B-12, the typical column and bent spacing is changed at bents 22 through 25. Here, to better support and center the weight of the crane, the bent spacing is reduced from 24'-0" to 18'-0" and the second row of columns from the east edge of the pier is spaced 32'-1½" from the first row.[8] The hammerhead crane was removed from B-12 ca. 1980 and at the time of the field work for this report (December 2009) no trace of it remained on the deck of the pier.

Moving from the end of the west pier at wharf B-12 toward the inboard end of the west basin, the structure changes from a pier which projects from the shoreline into the waters of the harbor, to a wharf built along the shoreline. The construction of wharf B-12 and B-13 reflects this change. At approximately 318' from the end of the pier, the two inner columns of the typical support system of four transverse concrete columns are replaced with square reinforced concrete piles, driven into the harbor bottom to support the wharf. At a distance of about 438' from the end of the pier both the longitudinal row of concrete columns and the row of piles at the west edge of the structure are ended and the structure narrows from 100'-0" to about 50'-0". This reflects the original configuration, when this was the point that the pier transitioned to a wharf, the piles being better suited to carry the structure in the shallow water near the shore. At this point a single row of piles is added at the west edge of the structure. This arrangement of one concrete column at the east edge of the wharf, a double row of concrete piles at about 35'-8" from the edge and a single row of piles at about 50' from the edge continues south until a point about 834' from the end of the pier where the concrete columns at the east edge of the wharf are also replaced with concrete piles set in groups of seven. About 96' further south, toward wharf B-14, the single row of piles at the inboard side is discontinued, and the support of the structure is accomplished with two rows of piles. Here the wharf narrows to about 37'-2" wide. Wharf B-13 continues about 300' to the point where it begins to curve at the base of the west basin to join wharf B-14. To make this curve, the outboard edge of the wharf employs three chords on a 150' radius to make the 90° transition to the B-14 wharf at the head of the repair basin.

The wharf at wharf B-14 is about 64'-1" wide, supported on two double rows of reinforced concrete piles which are spaced 28'-2¾". The rows of piles at the outboard edge are 3'-0" apart and the rows at the inboard edge are 4'-0" apart. Here and at other areas of the wharfs which are supported by driven concrete piles, the piles are capped by longitudinal reinforced concrete pile cap girders about 5'-6" high. The girders are typically flared at their lower ends, to a width of between 5'-6" and 6'-6" from a web thickness of 3'-0".[9] The top surface of the deck above these girders has recessed slots for the tracks of the portal cranes which were used at the repair basins. The girders are crossed by transverse concrete beams about 4'-0" high, spaced typically every 12'-0" on center.

At B-14 and also at B-19 (at the east basin) the outboard area of the wharf is lowered to near the water line. This lowered area is supported by an additional two rows of concrete piles. A stairway at each end of the wharf leads down about 9'-0" to the lowered section of deck about 12'-6" wide that is at an elevation 0f 3'-0" above the mean low water line. This lowered section

[7] NAVFAC drawing 116944, September 9, 1933.
[8] NAVFAC drawing I-N15-191, April 17, 1933.
[9] NAVFAC drawing H-8, February 12, 1934.

of deck is about 120' long at B-14 at the west basin and about 144' long at B-19 at the east basin. At the inboard side of the lowered section the quay wall has a sloping pent roof of corrugated sheet metal which projects about 4' and four doorways which open into rooms that are located beneath the elevated section of the wharf deck. The rooms typically measure about 20' wide and about 35' deep. Windows are located next to the doorways; several are original twelve-light metal-frame with pivoting eight-light sections. The interiors have exposed concrete posts and beams. The construction of wharf B-14, as well as the radius and chords of the transition at its ends, is duplicated at wharf B-19, the wharf at the base of the east basin.

The construction of the 100' wide middle pier which is comprised of wharfs B-15, B-16, B-17, and B-18 is the same as the end section of the west (B-11/B-12) pier. This consists of the typical foundation of concrete columns arranged in transverse rows of four, capped by reinforced concrete beams with a reinforced concrete deck and curb, all with the typical dimensions of the west pier. This four-column construction at the middle pier begins at a point about 102' from the outboard edge of wharfs B-14 and B-19, where the radii of the two wharfs meet to form the 100' wide pier.

The wharfs at the east quay wall, B-20 and B-21 are built on reinforced concrete piles with a double row of piles on 3'-0" spacing at the inboard side of the wharf, about 9'-9" from the inboard edge. The piles supporting the outboard side of the wharf are in groups of seven piles that are spaced 12'-0" apart on centers. The B-20/B-21 wharf is built with 4'-9" high transverse reinforced concrete beams and a reinforced concrete deck that is 12'-0" above the mean low water level. The thickness of the deck varies at this wharf from a maximum of about 2'-3" under the areas that are recessed for railroad tracks to a minimum of about 10" at the inboard side. The outboard side of the deck is about 1'-3" thick where it overhangs the water. The width of wharfs B-20 and B-21 is 42'-6".

All of these wharfs have had their original timber pile fenders replaced with driven concrete pile fenders. The replacement fenders consist of 2'-0" square reinforced concrete piles that are typically spaced about 10' on center. The piles are separated and supported at the edge of the docks by chocks and wales of a composite synthetic material as an alternative to timber. The wales separating the piles are 1'-4" x 1'-0" and the chocks holding them away from the edge of the dock are 10" x 1'-0". At numerous areas along the docks the piles are driven into groups of four and spaced much closer together (approximately 1'-4") in order to provide better support for the mooring of large vessels.

All the docks are equipped with mooring bitts and bollards that are secured to the edge of the dock at areas where the curb is widened to about 3'-8". The bitts feature twin posts, each about 2'-2" high and 1'-6" in diameter with 1'-11" diameter top caps that are spaced about 4' on center apart. The metal bitts are cast integral to a metal base measuring about 6' long and 2'-4" wide that is secured to the curb. The single metal bollards are each about 3'-6" high and 1'-1" in diameter with a 1'-11" diameter top knob. The bollards have a small projection cast onto their inboard sides about halfway up the post and they are also cast integral to a metal base about 3'-2" square that is secured to the curb.

Two electrical substation buildings are located at the repair basins, one is at B-13 (Facility 132) and one is near the center point of the middle pier B-15 to B-18 (Facility 133). These buildings are concrete construction, rectangular in plan (approximately 20' x 120'), two-story with flat roofs. Each building has a one-story section at its north end which has a low-slope gable roof.

The two-story section has a stucco finish with pilasters defining the bays of the building. Windows are found only at the second floor; nine-light metal-frame with three-light hopper sections at their tops. Recessed panels the widths of the windows extend down from the window sills to rectangular screened vents set just above the water table. Above the windows are rectangular fixed louver vents. The buildings have large-scale metal overhead doors and a human-scale four-light hinged door at their south ends. The north (single-story) sections of the buildings are built of concrete block and have large fixed louver vents at the side walls and double flush metal doors at the north end. At the north end of Facility 132 there is a free-standing fire alarm pull box on a metal pedestal with a total height of about 5'-10". This pull box is marked "Gamewell Pull Box Station 231." This pull box was relocated from its original position at the north end of the original two story section of Facility 132 when the single story section was built.

Three latrine buildings (Facilities 134, 135, and 136) are located at the repair basins. All are similar single-story buildings with rectangular plans (approximately 28'-0" x 20'-0"), concrete construction, and flat roofs. The buildings have a prominent water table, pilasters that define the bays, and horizontally elongated screened openings set high on the walls. These buildings are located at B-13 (Facility 134), B-15/18 (Facility 135), and B-20 (Facility 136).

The north end of wharf B-21, a section about 123'-6" long is built on typical 3'-9" diameter concrete columns at its outboard side, and reinforced concrete piles at its inboard side. This section of wharf also has a steel sheet pile wall at its inboard side. The piles for this are 50'-0" long, driven into the earth at the inboard edge of the wharfs so that their tops are at an elevation of 7'-6" above the mean low water line. Steel tiebacks are installed in the sheet piling at 2'-0" above the mean low water line. These extend back varying lengths from 33'-0" to 38'-0" to deadmans set in the bank.

This section of wharf was constructed in 1936, after the previous sections of wharf and pier at the repair basin. Except for the use of concrete columns in lieu of piles at its outboard side and the sheet pile wall, its construction is the same as the wharfs B-20 and B-21 to the south. This construction was carried around the corner of the wharf and about 291' eastward along the length of wharf B-22. About 85' east of the outboard corner where wharfs B-21 and B-22 meet is a concrete stairwell that descends through the deck of the wharf to a small craft landing at water level. The opening through the deck for the stairs is about 9' from the edge of wharf B-22 and is fitted on three sides with a metal pipe railing with metal pipe handrails that extend downward on both sides of the stairs.

At B-21 there is evidence of the bomb that pierced the dock and damaged the USS *Honolulu* during the Japanese attack of December 7, 1941. This consists of an irregular shaped concrete patch about 4' in diameter, smooth and level with the surface of the deck. It is located just inboard of the curb at the edge of the dock and about 325' from the B-21/ B-22 corner of the wharf, almost exactly even with the "325" sign painted on the curb.

Historic Context:

Wharfs B-11 to B-21 were completed in late 1935. Title blocks for the original 1933 drawings show that the plans were prepared by the U.S. Navy Bureau of Yards and Docks, Naval Station Pearl Harbor. The design manager listed on most of the original 1933 drawings is "Allen."[10] A

[10] NAVFAC drawing 116927, 116928, 116931-116933, 1933.

number of original drawings exist that indicate the construction of the wharfs was done by Hawaiian Dredging Co. Ltd. and Grace Bros. Ltd., both firms located in Honolulu.[11] The work was accomplished under contract NOy-2034.[12]

As early as 1924 the Navy was planning to dredge the repair basin area to create this wharf space. A drawing dated July of that year shows the results of undated test borings in the vicinity of what would become docks B-11 through B-21.[13] At that time the 1010 wharf, marine railway, and torpedo boat piers 1, 2, & 3 (no longer extant) were the shoreline facilities to the northeast of the proposed area to be dredged. The existing shoreline ran from torpedo boat pier Number 3 (at about the present mid point of B-12) southeast to near the present corner point where B-21 joins B-22.[14] The 1924 plans were for two basins separated by a pier, a configuration which was ultimately constructed.

During the early 1930s there was work for the dredges at Pearl Harbor. "In the first two years of the decade, the everlasting dredging of the entrance channel was continued, along with waterfront improvements".[15] This is when the dredging began at the site of the future repair basin area, in June 1931[16] after another round of much more extensive borings and soundings.[17]

An appropriation of $930,000 for the "development of the repair basin" was made in August, 1932. The work at the basin was to include "piers 700 feet long [to] provide facilities for four battleships to dock during repairs. Later, this will be enlarged to care for as many as eight large ships."[18] At that time it was expected that the work would be completed by the end of the following year, 1933.

This date seems to have been a bit ambitious of the Navy, as bids for the work, consisting of "building a long pier and quay wall" for an expected amount of $800,000, were not opened as of December 1932. At that time the repair basin area "located between the entrance to the Navy Yard and the Ten-Ten dock" was reported as "partly dredged."[19] The construction of the west quay walls and middle pier at the repair basins was well underway by April 1935, the pier at B-11/B-12, the wharf at B-13, B-14 and about half of the middle pier separating the two basins, at B-15 and B-18, was built.[20] It was expected that the repair basins would be competed by the end of 1935.[21]

Wharf B-11 was the west-facing section of the pier constructed between the existing torpedo boat piers and the west repair basin. On its west side, this pier extended out from the shoreline about 450'. In 1943, when the third repair basin was built, the length of this side of the pier was

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[11] NAVFAC drawing 1267, May 2, 1934 and drawing H-8, 1934.
[12] NAVFAC drawing H-4, March 30, 1934.
[13] NAVFAC drawing E-116, July 10, 1924.
[14] NAVFAC drawing A-152, June 30, 1929.
[15] Landauer, Lyndall, and Donald Landauer, *Pearl: The History of the United States Navy in Pearl Harbor*, (South Lake Tahoe, CA: Flying Cloud Press, 1999), 249.
[16] National Archives and Records Administration (NARA), 80 CF box 151 photo 16406, June, 19, 1931.
[17] NAVFAC drawing 11109, January 14, 1931.
[18] "Navy Expects to Spend More Than 3 Million," *Honolulu Star Bulletin*, August 10, 1932, 1.
[19] "Navy Prepares for Awards of Big Contracts," *Honolulu Star Bulletin*, December 8, 1932, 1.
[20] NARA, 80 CF box 151, 7973-3, photo 18324, April 3, 1935.
[21] "Pearl Harbor Improvement Turned Down," *Honolulu Star Bulletin*, April 23, 1933, 1.

increased to about 675' as dredging moved the shoreline back. Dock B-11 remained at its original position on this pier, and docks B-7 through B-10 were designated on the remaining edges of the 1943 basin.

As B-11 through B-21 at the repair basins came near to completion in November 1935, there was speculation that they would be used to overhaul four Navy cruisers, beginning with the USS *Richmond* on April 6, 1936, which were scheduled to put in at Pearl Harbor for overhauls. This was the case, and the repair basins B-11 through B-21 were the site of the first "major overhaul of a fighting ship bigger than a destroyer" at Pearl Harbor when the *Richmond* arrived[22] and began a new program of larger ship overhauls at the Navy Yard. The remaining cruisers (USS *Portland*, USS *Minneapolis*, and USS *Louisville*) scheduled for overhaul at B-11 through B-21 were due to arrive at three-month intervals.[23] The purpose of increasing the overhauling capabilities by constructing the new wharfs B-11 through B-21 and the repair basins at Pearl Harbor was "to build up and extend the proficiency of the Pearl Harbor navy yard for repair against time of war" ($38,145,354 Is Spent In Year At Navy Yard").[24]

While the *Richmond* was in the water at the repair basin, it was entirely dependent upon shore facilities for power and other services, as all its systems were shut down for overhaul, even though its crew was still living aboard. After the work at the repair basin docks was completed the ship would be moved into the dry dock for a hull cleaning and repainting before being sent back out for duty. The entire overhaul process took about three months for a cruiser, battleship, or submarine.[25]

Two electrical substations were built to provide power to the berthed ships that were undergoing repair. Facility 132 was constructed on the wharf at B-13 and Facility 133 was constructed on the middle pier, near its center point. An additional electrical substation to service the east quay was added on the northwest corner of the sheet metal shop, Facility 72.

After their construction, the repair basin wharfs B-11 through B-21 were referred to by their phonetic alphabet designation of "Baker." The phonetic alphabet is a list of words that are used to identify letters in a message transmitted by radio. During the years of World War II and up until 1957 the U.S. Navy used the word "Baker" for the spelling of the letter "B." The B docks were historically known as the "Baker Docks" during this period; this designation appears on architectural plans for the repair basins. The World War II phonetic alphabet was widely accepted for everyday use in describing the Baker Docks and other wharfs at Pearl Harbor (such as the King Docks at Kuahua, K-1 to K-11) from at least 1947 to 1950.[26] The B docks only came to be know as the "Bravo" docks after the U.S. Navy switched to the current NATO phonetic alphabet in 1957.[27]

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[22] "Big Warships Are Due Here For Overhaul," *Honolulu Star Bulletin*, November 4, 1935, 1.
[23] "Navy Doing $225,000 Business Monthly In Overhauling Vessels At Pearl Harbor," *Honolulu Star Bulletin*, April 18, 1936, 1.
[24] "$38,145,354 Is Spent In Year At Navy Yard," *Honolulu Star Bulletin*, May 2, 1936, 1.
[25] "Navy Doing $225,000," *Honolulu Star Bulletin*, April 18, 1936, 1.
[26] NAVFAC drawing I-N15-631, I-N15-635, I-N15-641, August 18,1947, and "King Docks Oil Blaze Reported," *Honolulu Star Bulletin*, February 27, 1947, 1.
[27] Naval Historical Center, "Phonetic Alphabet and Signal Flags," webpage www.history.navy.mil/faqs/faq101 accessed on December 20, 2005.

In 1936 an L-shaped extension was built off the north end of wharf B-21. This construction extended B-21 an additional 123' to the northeast and then turned 90 degrees southeast to create 290' of wharf at dock B-22. The construction involved additional dredging along the B-22 side of the wharf and the removal of the pre 1929 Commandant's Boathouse (Facility 63) at Landing No. 3, also at B-22. Original drawings for the work are dated January 29, 1936.[28]

Japanese attack of December 7, 1941: On the morning of the Japanese attack of December 7, 1941, there were fourteen vessels moored in the repair basins at docks B-12 through B-21, most undergoing work and in various states of disassembly. The positions of the vessels listed below was determined from a review of the after action reports filed by each vessel's commanding officer following the attack:[29]

B-12 USS *Ramapo* (AO-12)

B-13 USS *Rigel* (AR-11)

B-15 USS *Tracy* (DM-19
USS *Prebel* (DM-20)
USS *Cummings* (DD-365)

B-16 USS *New Orleans* (CA-32)

B-17 USS *San Francisco* (CA-38)*

B-18 USS *Pruitt* (DM-22)
USS *Sicard* (DM-21)
USS *Ontario* (AT-13)

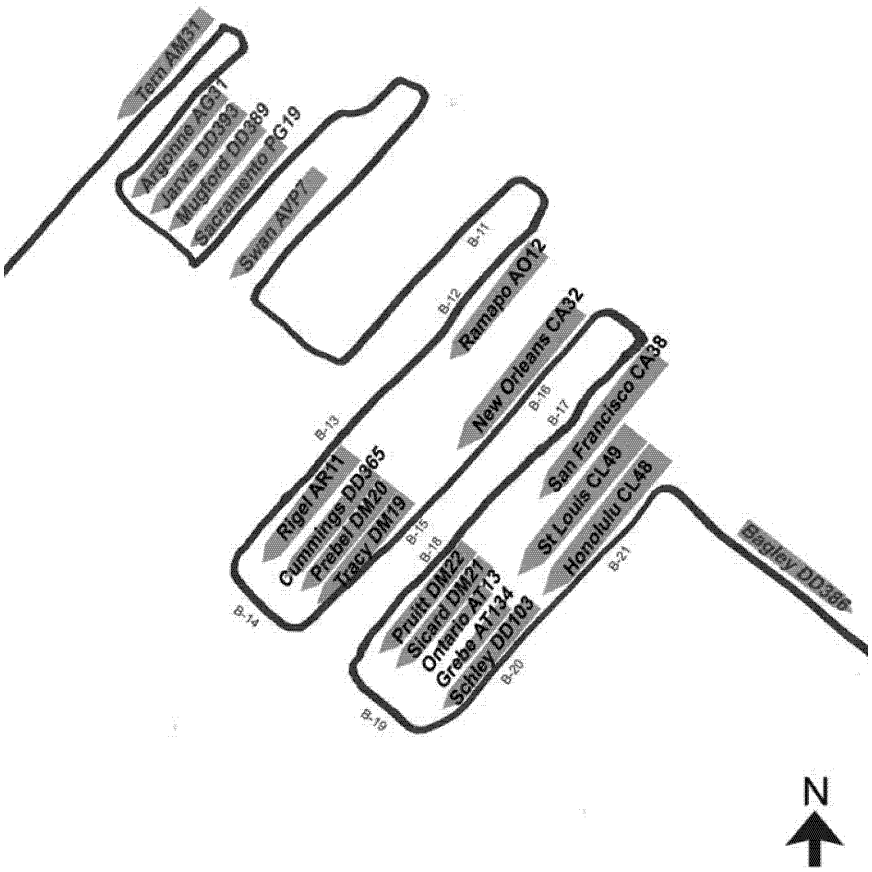
B-20 *USS Grebe (AM-43)**
*USS Schley (DD-103)**

B-21 USS *Honolulu* (CL-48)
USS *St Louis* (CL-49)

*The wharf location of the USS *San Francisco*, *Grebe*, and *Schley* are based on a secondary source, Madsen, Daniel, *Resurrection: Salvaging the Battle Fleet at Pearl Harbor*, (Annapolis: Naval Institute Press, 2003), 7. Two of these vessels have no after action report on file (*Grebe* & *Schley*) and one (*San Francisco*) has no location noted in its after action report.

Seven other vessels were moored nearby: at dock B-22, USS *Bagley* (DD-386); at marine railway, USS *Swan* (AVP-7); at 10-10 slip, USS *Sacramento* (PG-19), USS *Mugford* (DD-389), USS *Jarvis* (DD-393), USS *Argonne* (AG-31); and at 10-10 pier, USS *Tern* (AM-31).

[28] NAVFAC drawings 122465 to 122476, January 29, 1936.
[29] Report of Pearl Harbor Attack, December 7, 1941, After action reports of various vessels.



Position of vessels at the repair basins wharfs B-11 to B-21
on the morning of December 7, 1941. (Sketch prepared by Mason Architects, Inc.)

Several of the vessels moored at docks B-12 through B-21, as well as areas of the docks themselves were damaged during the attack. A bomb passed through the deck of wharf B-21, and detonated near the USS *Honolulu* which was moored there, damaging the ship near number 2 turret.[30] A plaque marking this bomb strike is set near the edge of the wharf, which reads:

> At 0755, 7 December 1941 near this spot an armor-piercing bomb penetrated the dock deck and exploded under water inflicting severe damage to the USS Honolulu.

This bomb, which was seen by observers as it fell, was dropped by a D3A Aichi "Val" dive bomber which attacked from the southeast at about 9:20 am. The dive bomber was piloted by Sea 1c. Motomu Kato from the Japanese carrier Soryu.[31] Witnesses reported seeing the bomb falling, at about a 45 degree angle from vertical. The bomb struck B-21 about 6' from the edge of the dock. It penetrated the concrete slab of the wharf deck, damaging underlying oil and

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[30] Sellers, Robert R., Narrative of Seaman 2/C aboard the USS *Honolulu* December 7, 1941. From website www.mytowncommunity.com accessed on October 6, 2005, and Report of Pearl Harbor Attack, December 7, 1941, After action reports of USS *Honolulu*. From website www.history.navy.mil/docs/wwii/pearl accessed October 5, 2005.

[31] Goldstein, Donald M., Katherine V. Dillon, and J. Michael Wenger, *The Way it Was, Pearl Harbor, The Original Photographs*, (Washington D.C.: Brassey's (US), Inc., 1991), 118.

water piping, and entered the water beneath B-21, detonating about 12' to 15' underwater and about 6' from the hull of the *Honolulu*. The bomb left an approximate 15" x 17" hole in the concrete deck of B-21. The bomb is thought to be either a 540 lb, 12" diameter bomb which contained 133 lbs of TNT, or an armor-piercing bomb of about 15" diameter with a relatively light explosive charge. To observers the underwater explosion had a muffled quality with no flash or flame.[32]

> The ship was rocked by the explosion and whipped longitudinally, with the node of vibration apparently amidships and equal amplitudes fore and aft. No permanent set resulted from this bending.[33]

The USS *Honolulu*, although sustaining damage near her #1 and #2 turrets which affected them, was able to open fire and expended 250 rounds of 5" ammunition during the course of the attack.[34]

Some of the vessels in the repair basins had their 3" deck armament removed at the time of the attack; others had their large caliber guns out of operation. Sailors from many of the ships opened fire on the attacking aircraft with machine guns, rifles, and pistols. Some ships sent crews to other nearby vessels to assist in manning anti-aircraft weapons there. For example, the USS *San Francisco*, "having no operable armament or major caliber ammunition on board," sent sailors to the USS *New Orleans*, which still had her 5" gun.[35]

On the *New Orleans*, all batteries except the 8" were firing by 8:10 am. The *New Orleans* had 9-8" guns, 8-5" guns, and 8-.50 cal. machine guns. The *New Orleans* reported that the repair basin area of B-14 through B-19 came under a "dive bombing attack by approximately ten enemy planes." This attack was thwarted by the combined fire from the *New Orleans* and the *Honolulu*, "undoubtedly save[ing] the ships of this area from more damage." A bomb detonated in the water between the USS *Rige*l and the *New Orleans*, damaging the vessels from fragments.[36]

The USS *St. Louis* also had her 5" guns, which began firing after interfering material from the repair work was cleared from the mounts. The *St. Louis* reported that six dive bombers attacked it and the *Honolulu* at about 9:00am. Four were turned away, the fifth dropped a bomb which exploded in the water about 200' from the vessel, and the sixth bomber is thought to have "dropped the bomb that damaged the *Honolulu*." The *St. Louis* also had six of her eight boilers operational. Steam was raised and the ship sortied at 9:31 am, standing out of the harbor. Just inside "entrance buoy No. 1" she fired on a suspected submarine with her 5" gun after two torpedoes were launched in her direction.[37]

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[32] Bureau of Ships, US Navy, "USS *Honolulu* Bomb Damage, December 7, 1941, Pearl Harbor," n.d. ca. January 1942, from NAVSEA Damage Control, Fire Protection Engineering, and CBR-D website: www.dcfp.navy.mil/mc/museum/War_Damage/1 accessed on December 2, 2009.
[33] Bureau of Ships, "USS *Honolulu* Bomb Damage."
[34] Sellers, Narrative.
[35] Report of Pearl Harbor Attack, December 7, 1941, After action reports of USS *San Francisco*.
[36] Report of Pearl Harbor Attack, December 7, 1941, After action reports of USS *New Orleans*.
[37] Report of Pearl Harbor Attack, December 7, 1941, After action reports of USS *St. Louis*.

The USS *Tracy* and USS *Preble* sent about 30 men to the USS *Cummings*, which had her 5" guns and opened fire with them at 8:11 am. The *Cummings* got underway at 10:40 am and joined the anti-submarine patrol which was outside the harbor entrance.[38]

The USS *Ramapo* also had her 3" gun, which she was able to get into action. The *Ramapo* was under the hammerhead crane at B-12 and was having her decks loaded with torpedo boats. The four torpedo boats on the deck of the *Ramapo* opened fire with their machine guns.[39]

The USS *Rigel*, a repair ship, had no arms installed and proceeded to get its motor launches underway to assist with rescue efforts. A bomb pierced the ship, exploded under it, and injured the crew of launch #2.[40]

The USS *Bagley* at B-22 opened up quickly with machine guns on some of the first few aircraft, causing an attacking plane to swerve and drop a torpedo which "exploded in the bank about thirty feet ahead of the *Bagley*."[41] This would have been to the southwest of the ship as the *Bagley* was moored with her starboard side to B-22. The *Bagley* also expended 165 rounds of anti-aircraft ammunition from her 5" guns during the attack.

Alterations to the docks: In 1939 piping was added at two points of wharf B-13 and at eight points at the middle pier (wharfs B-15 to B-18). This was for a suction system designed for cleaning ship's tanks called the Wheeler System. The piping consisted of a 4" sludge pipe which ran under the deck, from the outboard edge of the docks to a manhole located about 24'-0" from the edge.[42] Steam and freshwater lines were also piped to the manhole from existing supply lines under the deck.

The third repair basin was constructed in 1943. Dredging had not yet begun by August 19, 1942, but the third repair basin docks were built as of June 30, 1943. This work dredged the wharf at B-10 which removed the bank at the inboard side of B-12/B-13 and changed the structure there from a wharf to a pier.

In 1947 four concrete cylinder piles near the end of the pier at wharf B-12 were in need of repair. The exterior walls of the cylinders near the point where the flared base section begins had eroded. They were repaired by assembling 8'-6" diameter circular forms of ⅛" steel plate around the damaged area and filling with concrete. This repair was executed on three cylinders of the first row at the outboard east edge of the dock and one cylinder in the second row, inboard of them.

Cranes at the repair basins: In order to support the initial repair work that was planned for wharfs B-11 to B-21, a used hammerhead crane and four new portal cranes had been delivered to Pearl Harbor in the mid 1930s. Portal cranes P-52 (50-ton), P-53 (15-ton), P-54 (15-ton), and P-55 (15-ton) were diesel electric traveling cranes ordered under contract number NOy-2031.

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[38] Report of Pearl Harbor Attack, December 7, 1941, After action reports of USS *Cummings,* and Dictionary of American Naval Fighting Ships (DANFS), *Cummings*.
[39] Report of Pearl Harbor Attack, December 7, 1941, After action reports of USS *Ramapo,* and (DANFS), *Ramapo.*
[40] Report of Pearl Harbor Attack, December 7, 1941, After action reports of USS *Rigel,* and (DANFS), *Rigel.*
[41] Report of Pearl Harbor Attack, December 7, 1941, After action reports of USS *Bagley,* and (DANFS), *Bagley.*
[42] NAVFAC drawing I-N15-342 and I-N15-346, April 3, 1939.

They were manufactured by Star Iron and Steel Works, Inc. in 1934 and were erected at the naval shipyard in 1935.[43]

The portal cranes had a bridge-like frame with clearances of 22'-¾" in width and 25'-2" in height and ran on tracks that were spaced 28'-2¾" center-to-center.[44] These crane tracks were installed at wharfs B-12 to B-21 to accommodate the cranes. Sets of railroad tracks were laid between the crane tracks, allowing train cars to pass under the bridge frame of the portal cranes for transferring material on them to berthed ships.[45]

The hammerhead crane was brought in from the Brooklyn Navy Yard in 1933 in order to support the developing Naval Fleet at Pearl Harbor. It was erected on the pier at wharf B-12 at the west repair basin. This crane was the largest and most visible crane at Pearl Harbor. It was purchased for the sum of $422,444.24. It took almost two years for the crane to be erected and it was operational by 1935. The hammerhead crane was designed and fabricated ca. 1918 by the Wellman-Seaver-Morgan Company of Cleveland, Ohio. The firm was a leading manufacturer of steel plant equipment and designing and building large materials handling equipment for use in mining operations, but they also specialized in building electric cranes for shipyards. The hammerhead was originally rated at a 300-ton capacity when it was first constructed. However, when it came to Pearl Harbor, it was tested for a maximum of 200 tons, because that was all that was required. If a load of 300 tons was likely to be carried at Pearl Harbor, it would have to be tested it for the 300-ton load and it would be rated as such; however, gathering enough materials to test the lift was a substantial effort.[46]

During the December 7, 1941 Japanese attack the oiler USS Ramapo was berthed under the hammerhead crane. The crane was used the day before to load PT boats onto the open deck of the Ramapo for her to transport them to the Philippines. The morning of the attack four Pt boats had been loaded onto the oiler with the remaining two in cradles on dock B-12. In order to reduce the chances of fire during shipment the fuel tanks of the PT boats were filled with carbon dioxide gas. This prevented the PT boat crews from staring the gasoline operated hydraulic pump system which slewed the .50 caliber gun turrets on board. The crews cut the hydraulic lines which freed the turrets and allowed them to be trained and fired on the attacking aircraft. The PT boats fired several thousand rounds of .50 caliber ammunition that morning. It is unknown what damage the hammerhead crane received from the attack.[47]

During the war it was often advisable to initially berth incoming vessels with battle damage at B-12 under the hammerhead crane before they were transferred into the dry docks for repair. This was the case on July 10, 1944 when the USS Maryland arrived at Pearl Harbor with extensive damage to her bow sustained from a torpedo attack during the battle for Saipan. While berthed there divers could assess the damage and because the hammerhead crane "possessed the best crane service in the Navy Yard" it would be readily available if large and heavy portions of

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[43] Palumbo, Lorraine M., "HAER HI-68, U.S Naval Base, Pearl Harbor, Exterior Cranes," (Honolulu: September 2002), 17.
[44] Palumbo, "HAER HI-68, Cranes," 5.
[45] NARA, RG 71 CA box 166, folder "repair basin, 2nd folder" no photo #, ca. 1936.
[46] Palumbo, "HAER HI-68, Cranes," 17.
[47] "WW II PT Boats, Bases, Tenders," Website Into Action – Pearl Harbor and the Philippines www.ptboats.org/20-07-05-reports-002.html accessed January 21, 2010.

the damaged ship needed to be removed before dry docking.[48] In the case of the Maryland, "it was thought that possibly some of the damaged and presumably pendant structure might require removing before dry docking the vessel.[49]

The hammerhead crane was used to assemble the boom sections of the floating crane YD-121 onto its barge, ca. 1947. The hammerhead crane's last lift was in October 1973. In the late 1970s at the time the navy announced its plans to dismantle the crane, they released a call for bids for "immediate" purchase of the hammerhead crane. Bids were to be in by 4:00 P.M. January 30, 1980. Apparently, no bids were submitted, however, and the crane was demolished. In the late 1970s, the three 15-ton portal cranes, P-53, P-54, and P-55 were sold and removed from the repair basins. In 1999 the 50 ton portal crane, P-52, was dismantled and removed.[50]

Sources

A. Architectural Drawings:

Historic drawings are available as electronic scans only at the NAVFAC Pacific Plan/ File data base at Building 258, Makalapa, Pearl Harbor. Scans can be viewed and printed on 11" x 17" paper only. Some microfilms of drawings of the hammerhead crane are archived in the office of the Commander Navy Region Hawaii Historical Architect, Jeffrey Dodge.

B. Early Views:

Photographs of the dredging of the repair basins and the completed Baker Docks are available at the National Archives and Records Administration archives in series 71-CA-171 and in series 80 CF and 80 G. Aerial photographs of the Baker Docks during WWII are available at Hawaii State Archives, Admiral Furlong Collection. These photos were taken by the U.S. Navy and are considered in the public domain.

C. Bibliography:

"Big Warships Are Due Here For Overhaul" *Honolulu Star Bulletin*, November 4, 1935, p. 1.

Bureau of Ships, US Navy, "USS *Honolulu* Bomb Damage, December 7, 1941, Pearl Harbor," n.d. ca. January 1942, from NAVSEA Damage Control, Fire Protection Engineering, and CBR-D website: www.dcfp.navy.mil/mc/museum/War_Damage/1 accessed on December 2, 2009

Dictionary of American Naval Fighting Ships (DANFS). Online reference of U.S. naval vessels. Website www.hazegray.org/danfs accessed on December 21, 2005.

Goldstein, Donald M., Katherine V. Dillon, and J. Michael Wenger. *The Way it Was, Pearl Harbor, The Original Photographs*. Washington D.C.: Brassey's (US), Inc. 1991.

Landauer, Lyndall, and Donald Landauer *Pearl The History of the United States Navy in Pearl Harbor*. South Lake Tahoe, CA: Flying Cloud Press, 1999.

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[48] "USS *Maryland*, Chronological Account of Work Performed by Pearl Harbor Navy Yard. Transcript." Robert F. Walden Collection, University of Hawaii at Manoa, August 1944, 3.
[49] Ibid.
[50] Palumbo, "HAER HI-68, Cranes," 25-26.

National Archives and Records Administration (NARA). Photographs and written material. Washington D.C. Various dates.

National Archives at College Park (NARA II). Photographs and written material. College Pk., MD. Various dates.

Naval Facilities Engineering Command (NAVFAC) Drawings on file for wharfs B-11 through B-21. Various dates.

_____. Microfilmed drawings of hammerhead crane in archives of office of the Historical Architect. Various dates.

Naval Historical Center "Phonetic Alphabet and Signal Flags." Webpage www.history.navy.mil/faqs/faq101 accessed on December 20, 2005.

"Navy Doing $225,000 Business Monthly In Overhauling Vessels at Pearl Harbor" *Honolulu Star Bulletin*, April 18, 1936, Section 3 p. 2.

"Navy Expects to Spend More Than 3 Million" *Honolulu Star Bulletin*, August 10, 1932, p. 1)

"Navy Prepares for Awards of Big Contracts" *Honolulu Star Bulletin*, December 8, 1932, p. 1.

Palumbo, Lorraine M. "HAER HI-68, U.S Naval Base, Pearl Harbor, Exterior Cranes." Honolulu: September 2002.

"Pearl Harbor Improvement Turned Down" *Honolulu Star Bulletin*, April 23, 1935, p. 1.

Report of Pearl Harbor Attack, December 7, 1941 After action reports of individual vessels at the repair basins. From website www.history.navy.mil/docs/wwii/pearl accessed October 5, 2005.

Sellers, Robert R. Narrative of Seaman 2/C aboard the USS Honolulu December 7, 1941. Fom website www.mytowncommunity.com accessed on October 6, 2005.

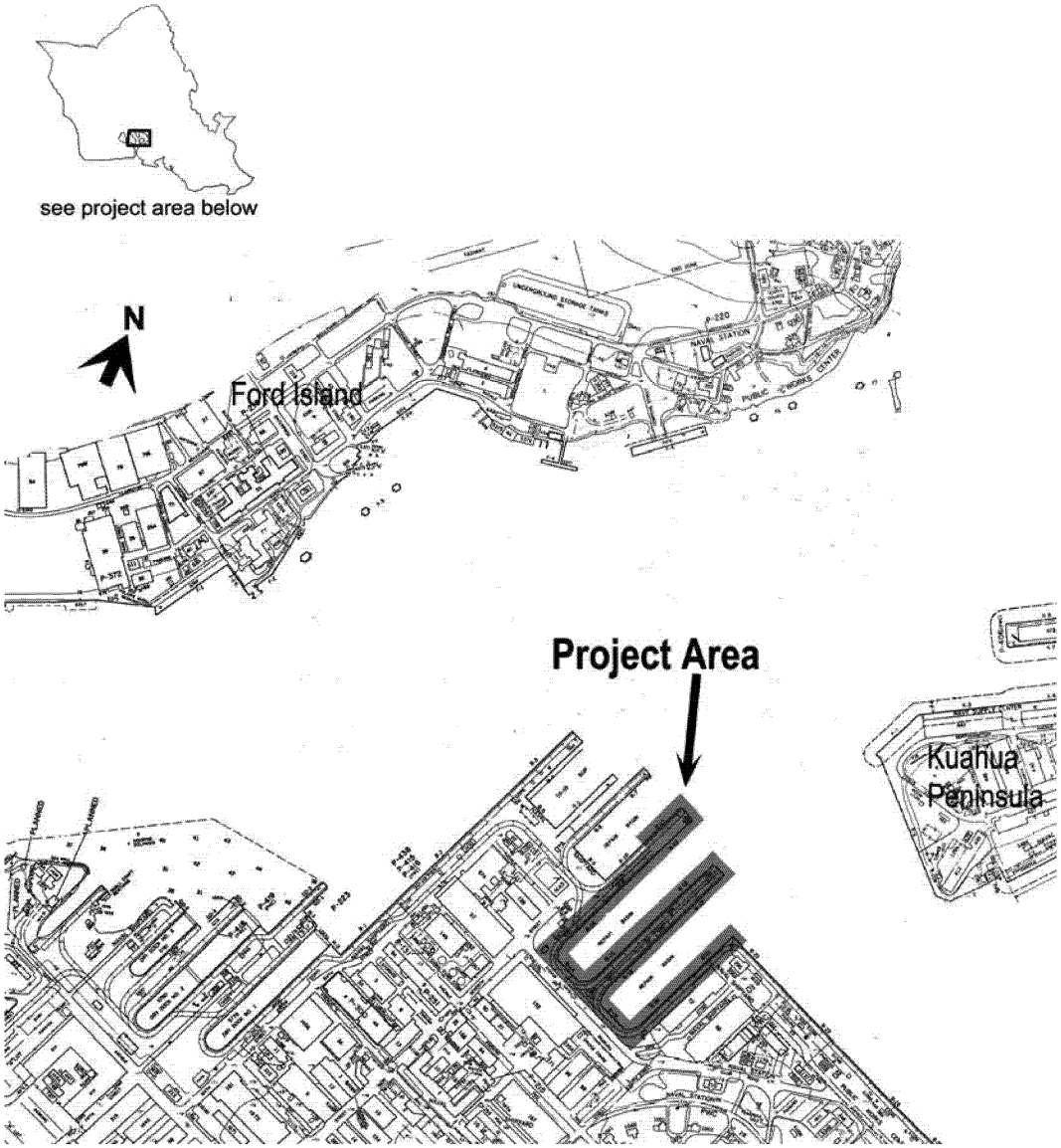
"USS *Maryland*, Chronological Account of Work Performed by Pearl Harbor Navy Yard. Transcript." Robert F. Walden Collection, University of Hawaii at Manoa. Box 1, FF8, Report USS Maryland. August 1944.

"WW II PT Boats, Bases, Tenders." Website Into Action – Pearl Harbor and the Philippines www.ptboats.org/20-07-05-reports-002.html accessed January 21, 2010.

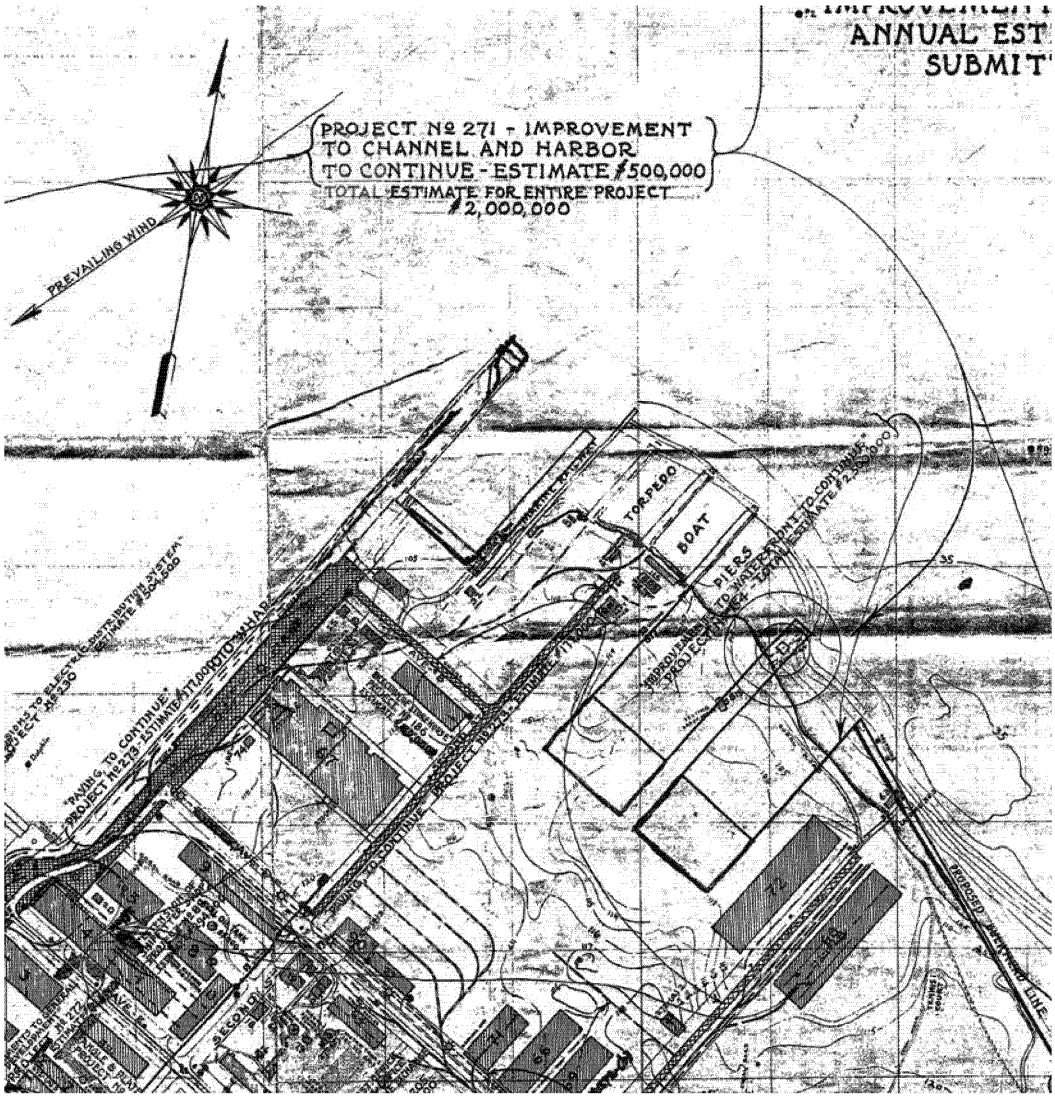
"$38,145,354 Is Spent In Year At Navy Yard" *Honolulu Star Bulletin*, May 2, 1936, p. 1.

Project Information:

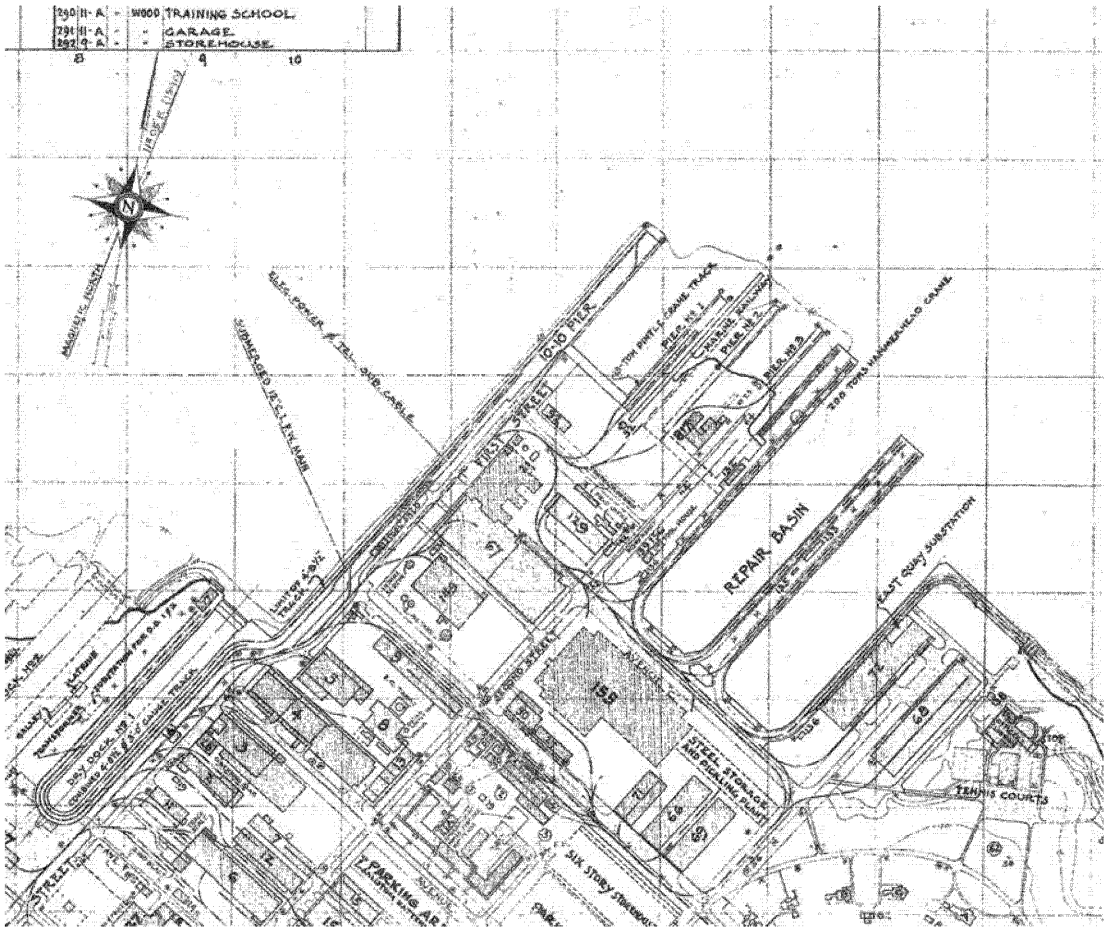
Photo documentation and recordation of these wharfs by the Navy has been done in anticipation of repairs to this structure. Photo documentation of historic facilities by the Navy assists in expediting planned undertakings by having the documentation prepared prior to taking actions. Also, photo documentation assists the Navy in gaining more information about its historic facilities to assist in making management decisions. This project is being supervised by Jeffrey Dodge A.I.A., Historical Architect at the Commander Navy Region Hawaii (CNRH). The photographic documentation was undertaken by David Franzen, photographer in October 2005 and was supervised by Jeffrey Dodge. Dee Ruzicka, Architectural Historian, of Mason Architects, Inc. prepared the written documentation. The field work was conducted for this report in December 2009.



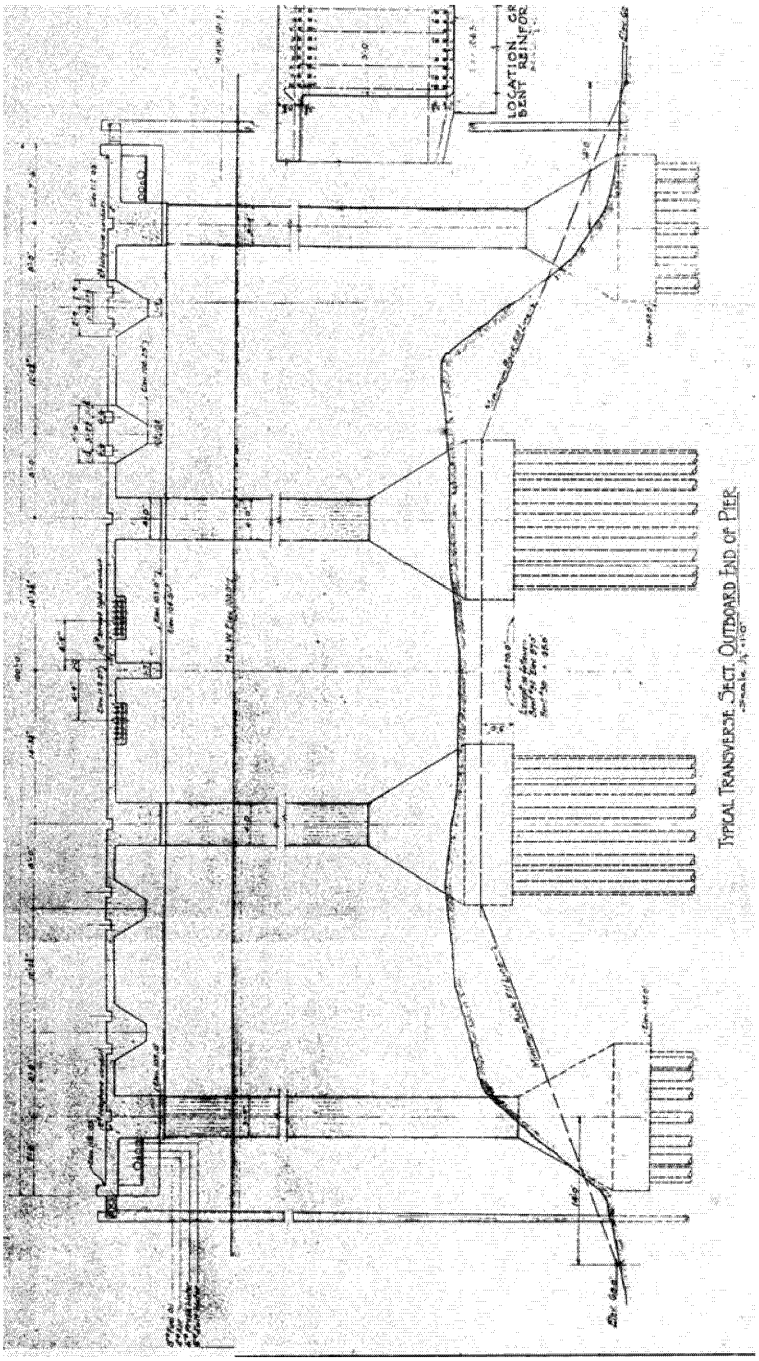
Portion of historic map dated June 30, 1929 showing the proposed dredging in the repair basin area. From Naval Facilities Engineering Command plan files, drawing A-152 "Map of the Yard and Adjacent Units Showing Developments to June 30, 1929."



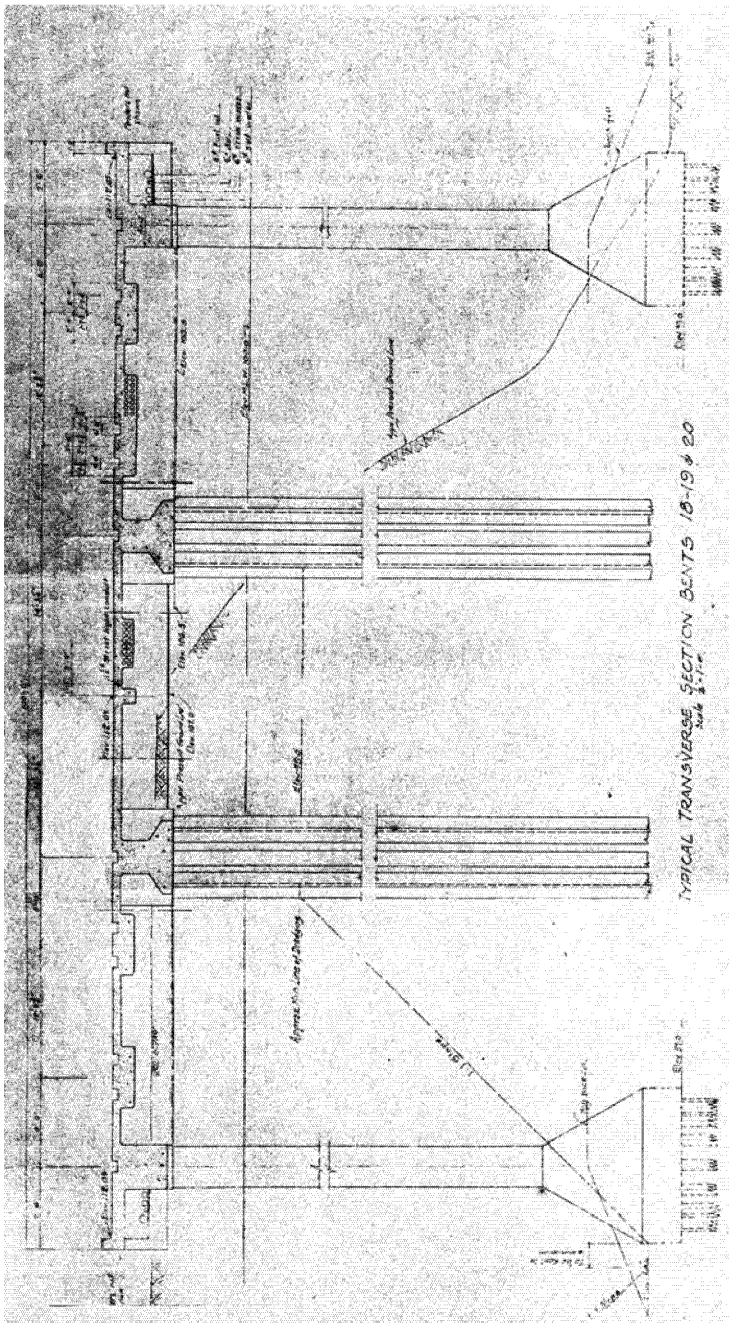
Portion of historic map dated June 30, 1941 showing the completed repair basins. From NARA RG 71, file # 1400-3-106, "Navy Yard, Pearl Harbor T.H. 14th Naval District Showing Conditions on June 30, 1941."



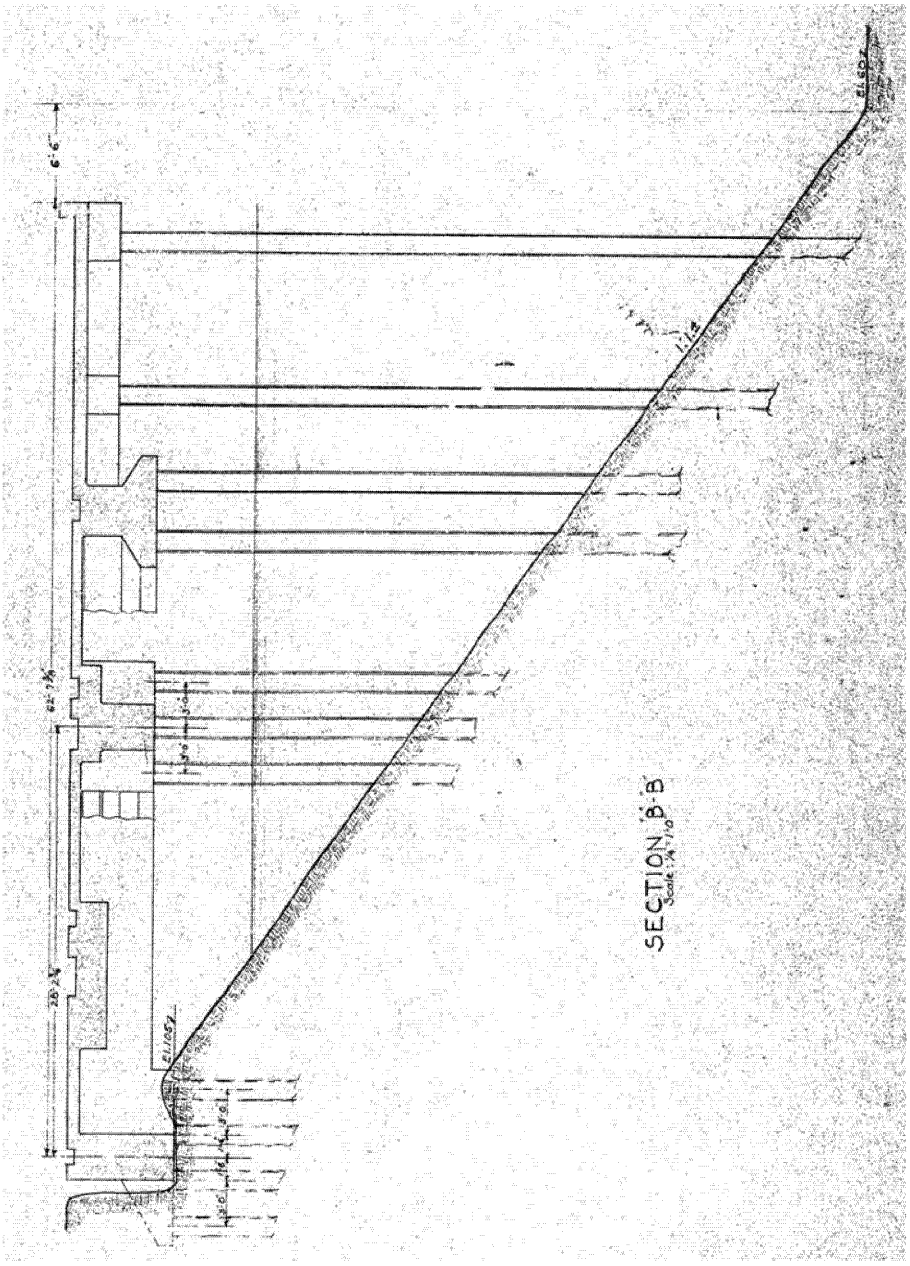
Portion of original drawing dated September 9, 1933 showing the typical columns and deck construction of pier structures at the repair basins. Note the recessed areas of the deck slab; for railroad tracks at the tapered beams, and for crane tracks above the columns. From Naval Facilities Engineering Command, Plan/ File dwg 116944, Repair Basin Pier (outboard end)."



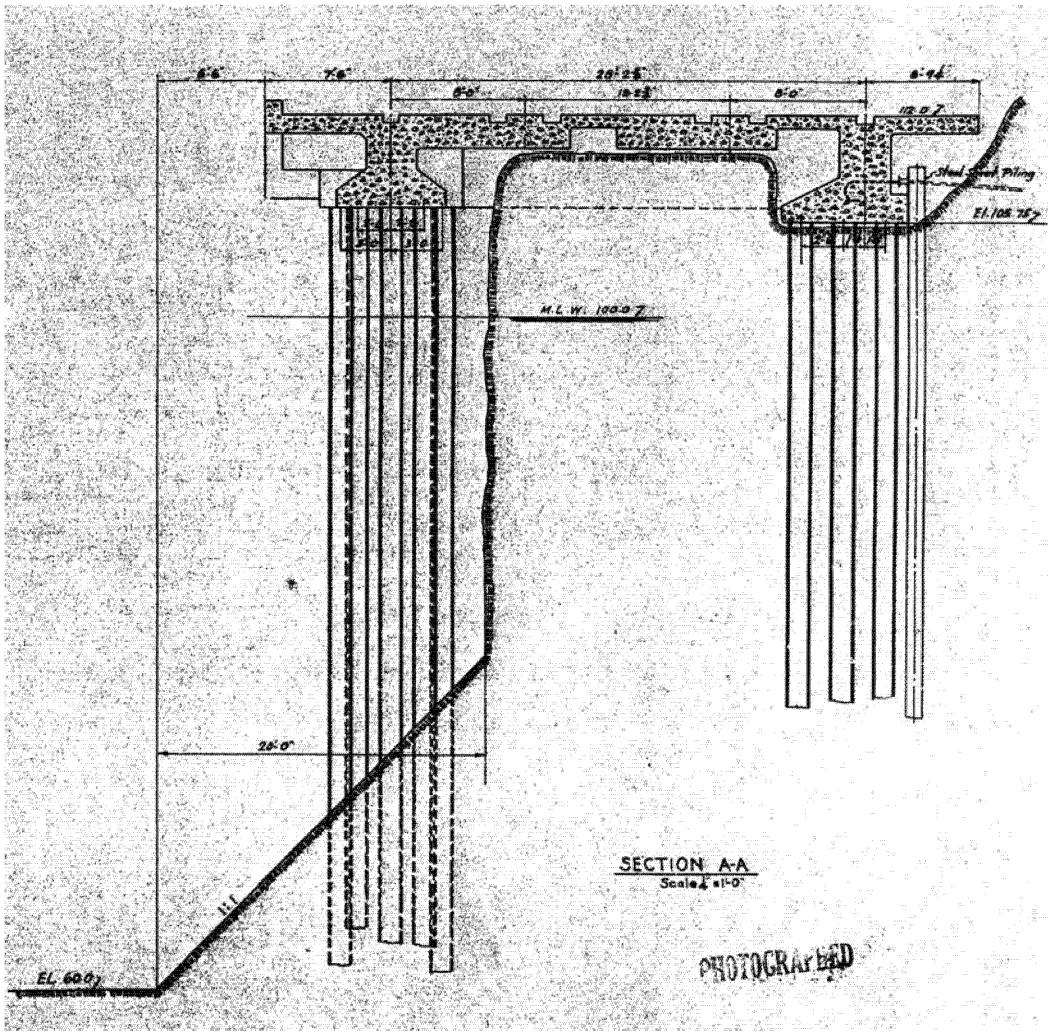
Portion of original drawing dated September 9, 1933 showing the typical columns, piles and deck construction of pier structures at the repair basins. From Naval Facilities Engineering Command, Plan/ File dwg 116939, "Repair Basin West Quay Wall (outboard end)."



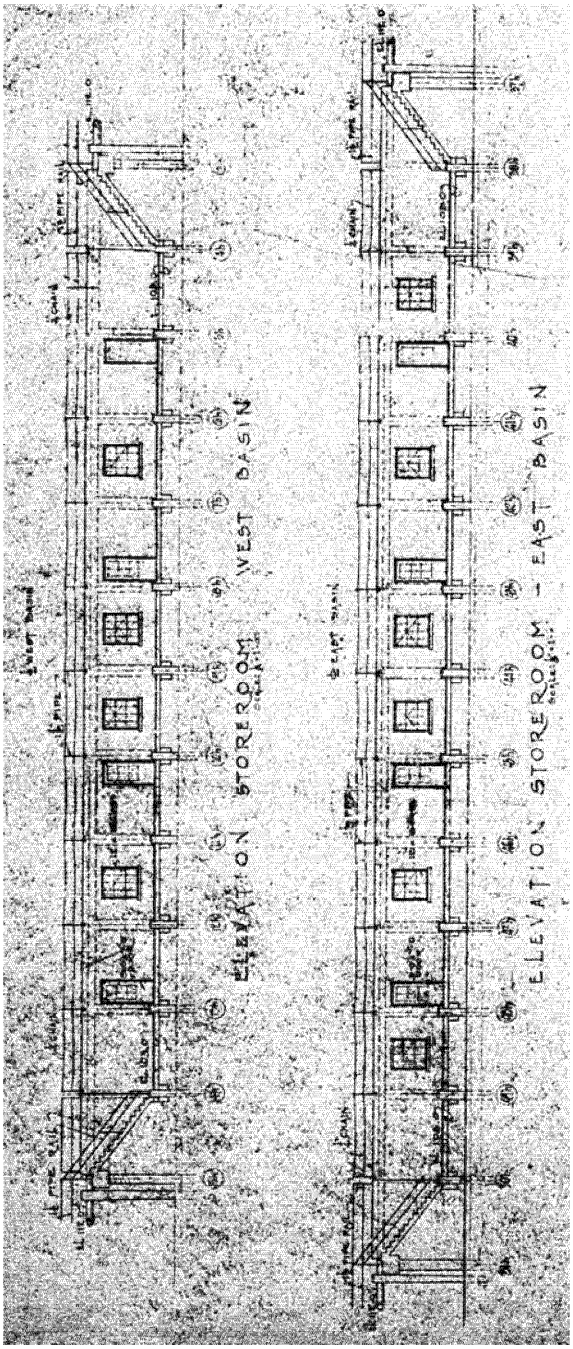
Portion of original drawing dated June 6, 1934 showing typical construction of the wharfs at the heads of the repair basins. From Naval Facilities Engineering Command, Plan/ File dwg I-N15-202, "Repair Basin East Quay at Head."



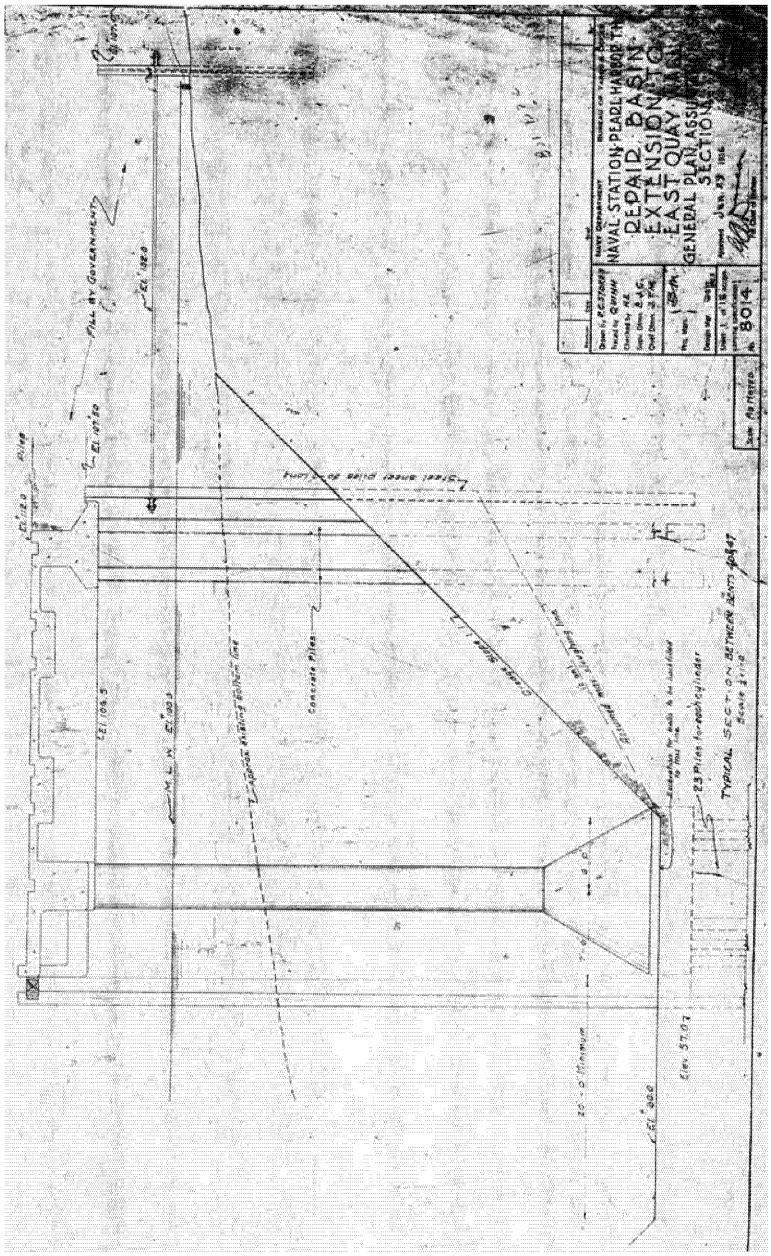
Portion of original drawing dated May 25, 1934 showing typical construction of the wharfs. From Naval Facilities Engineering Command, Plan/ File dwg I-N15-201, "Repair Basin East Quay."



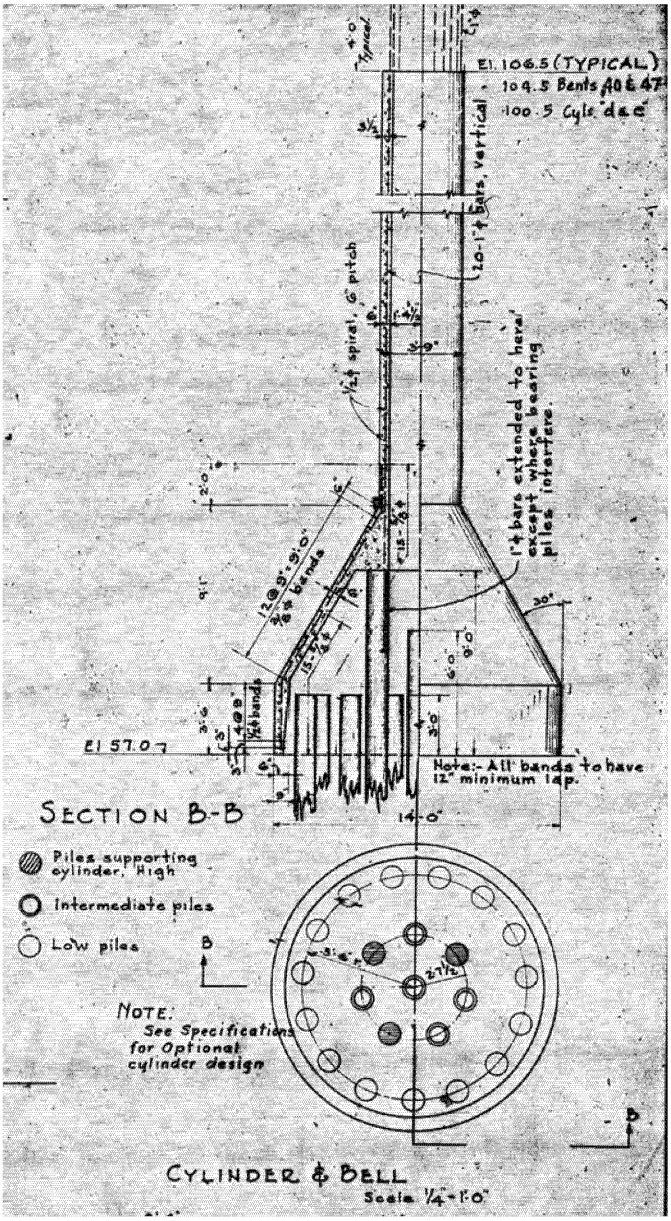
Portion of original drawing dated September 9, 1933 showing elevations of the rooms at the head of the east and west basins. From Naval Facilities Engineering Command, Plan/ File dwg 116948.



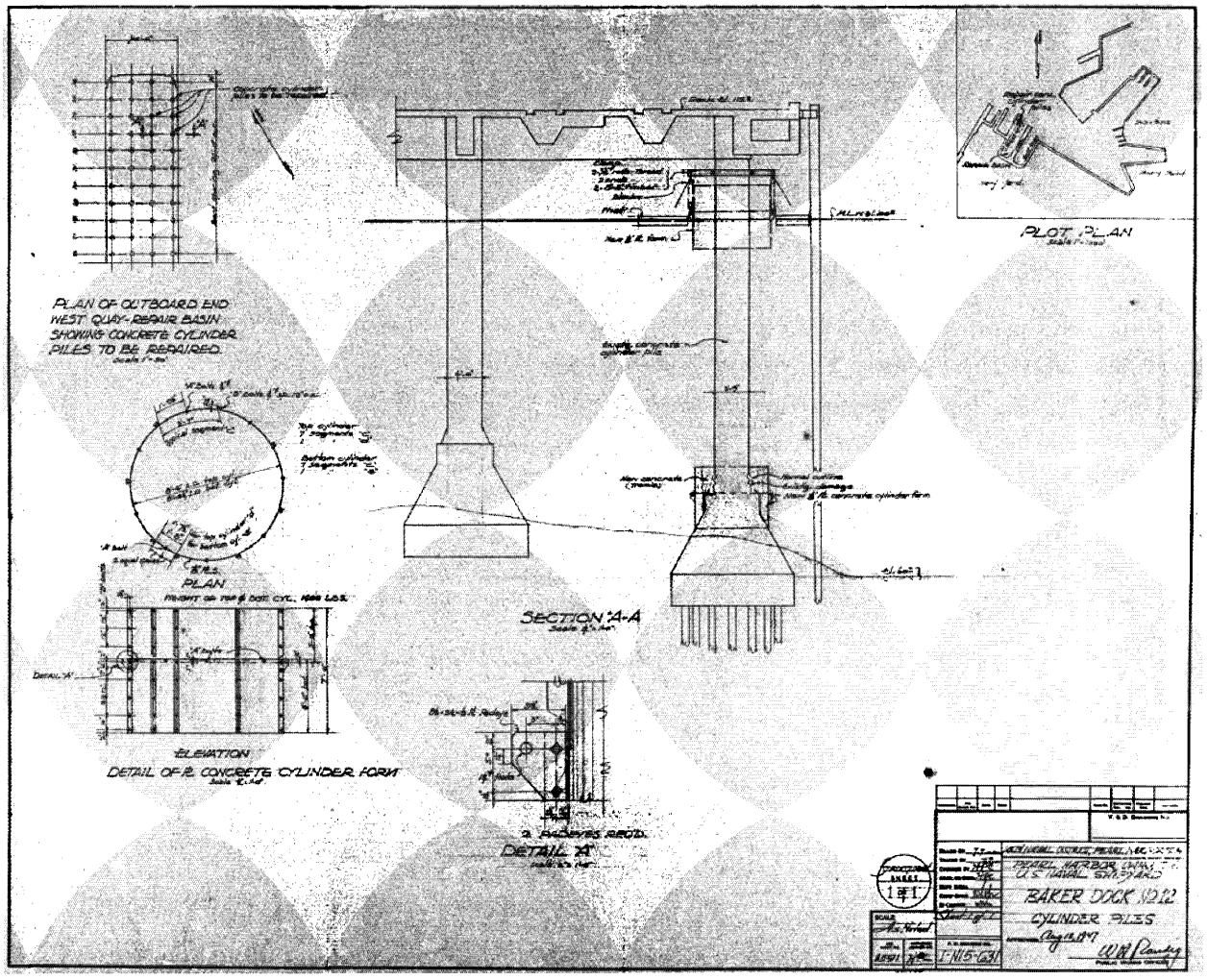
Portion of drawing dated January 29, 1936 showing typical construction of the extension of the east quay at wharf B-21. From Naval Facilities Engineering Command, Plan/ File dwg 122465, "Repair Basin Extension East Quay Wall."



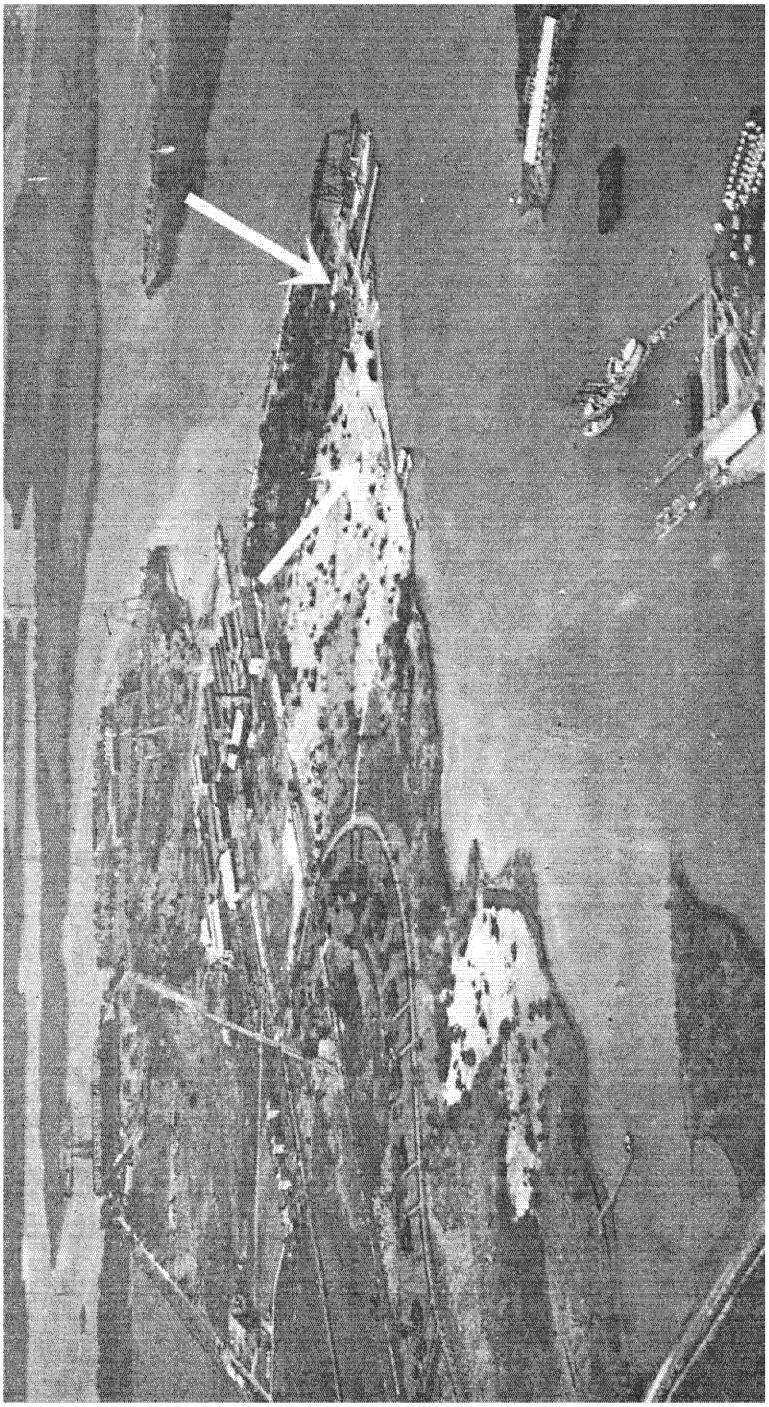
Portion of drawing dated January 29, 1936 showing the construction of the concrete cylinder and bell used for wharf foundations. From Naval Facilities Engineering Command, Plan/ File dwg 122470.



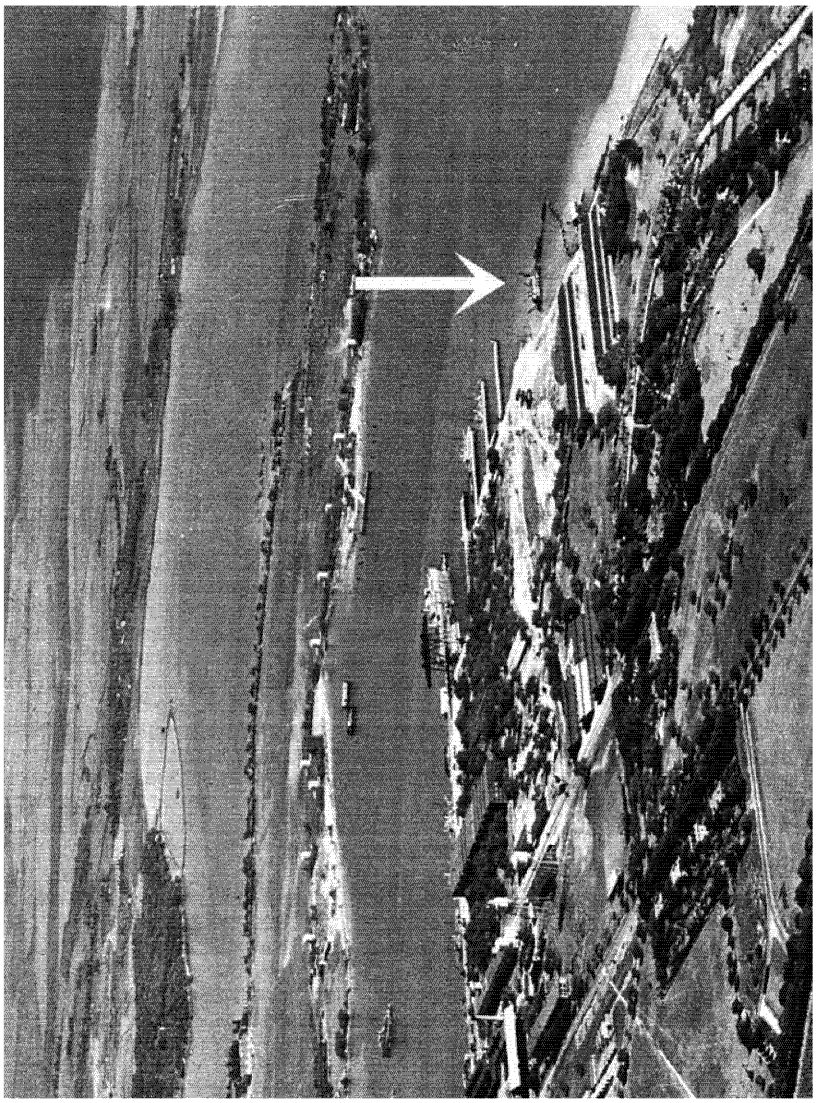
Drawing dated August 18, 1947 showing repairs to concrete cylinder piles at B-12. Note the title block which refers to the wharf as "Baker" dock. From Naval Facilities Engineering Command, Plan/ File dwg I-N-15-631, "Baker Dock No. 12 Cylinder Piles."



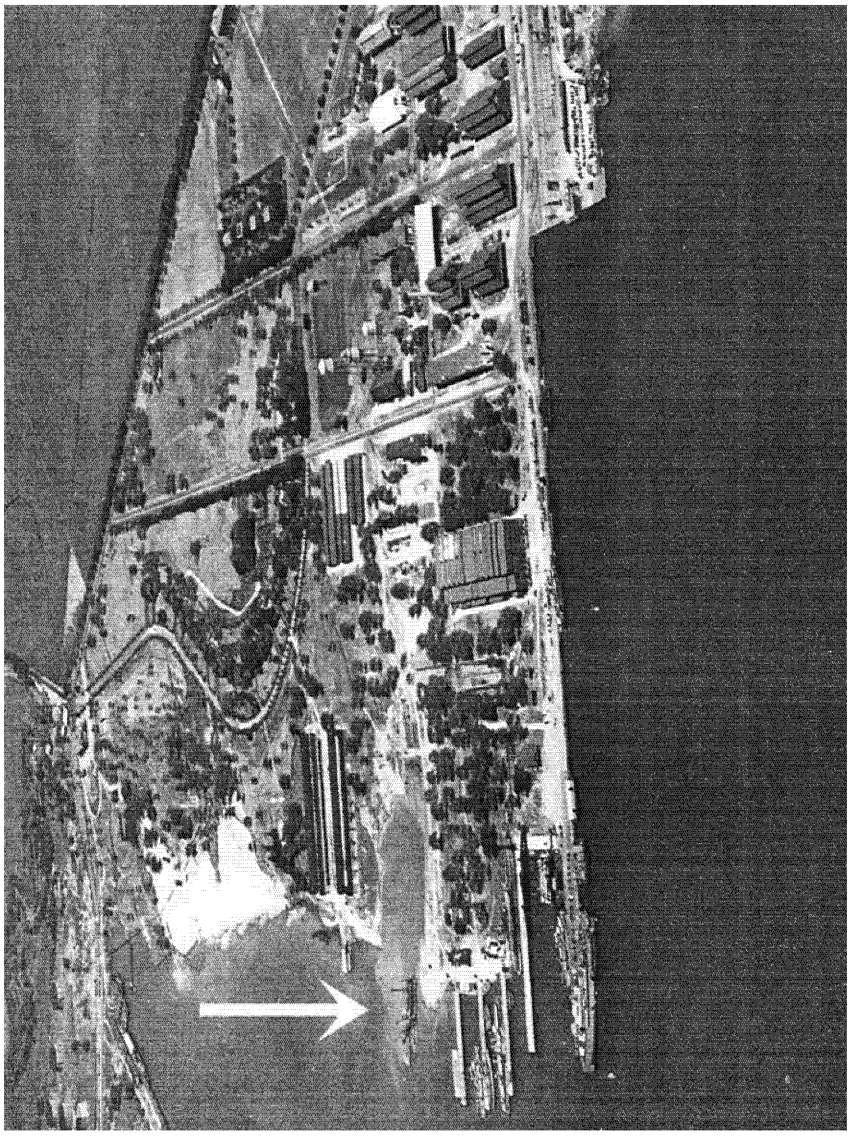
Portion of historic photo dated November 1, 1920 showing the area of the repair basins (between added arrows) before any dredging. Note the torpedo boat piers at the right. View facing west. From NARA, folder 71CA 165A, "PH 56"



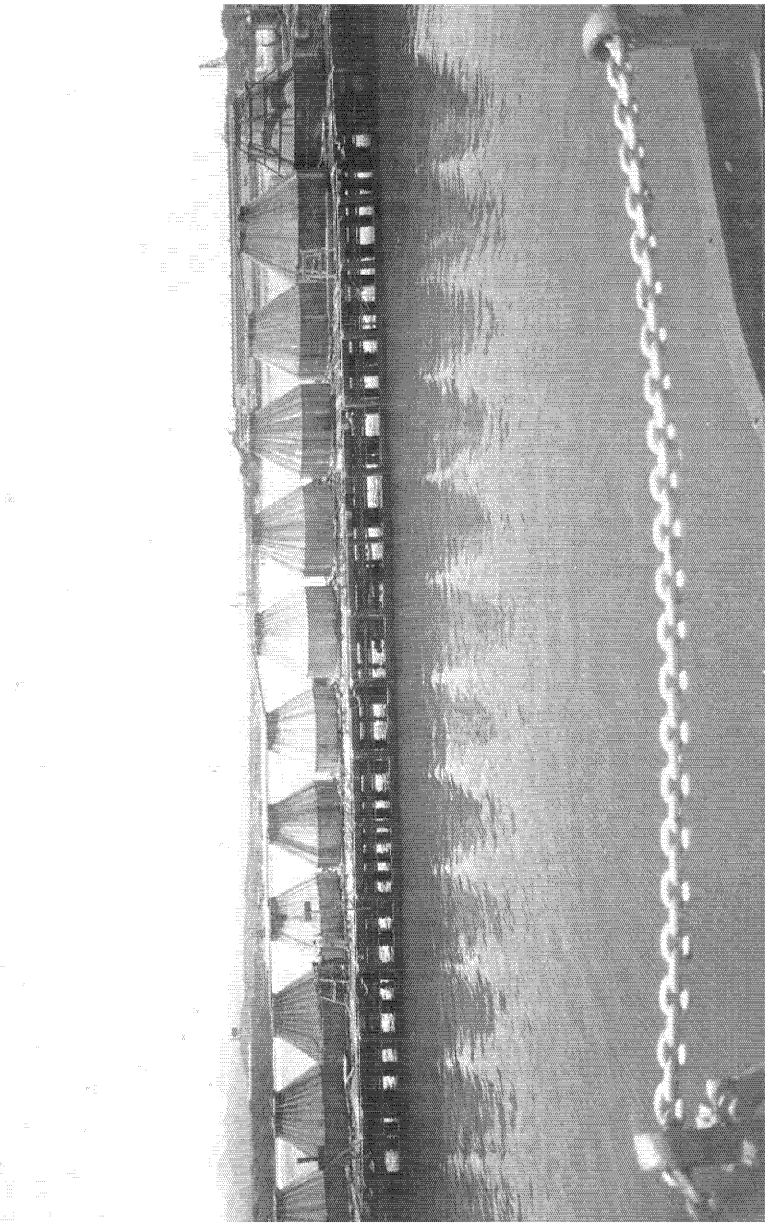
Portion of historic photo dated June 19, 1931 showing the beginning of dredging operations for the repair basins. Note the dredger (added arrow) at the harbor shoreline and the area of land to the left of it which will be removed. View facing north. From NARA II, 80 CF box 151, "PH # 16406."



Portion of historic photo taken July 16, 1931 showing dredging operations at the site of the repair basins. Note the dredge (added arrow) and land removed to its right. View facing southeast. From NARA, 71 CA 171-B-5, "PH # 7."

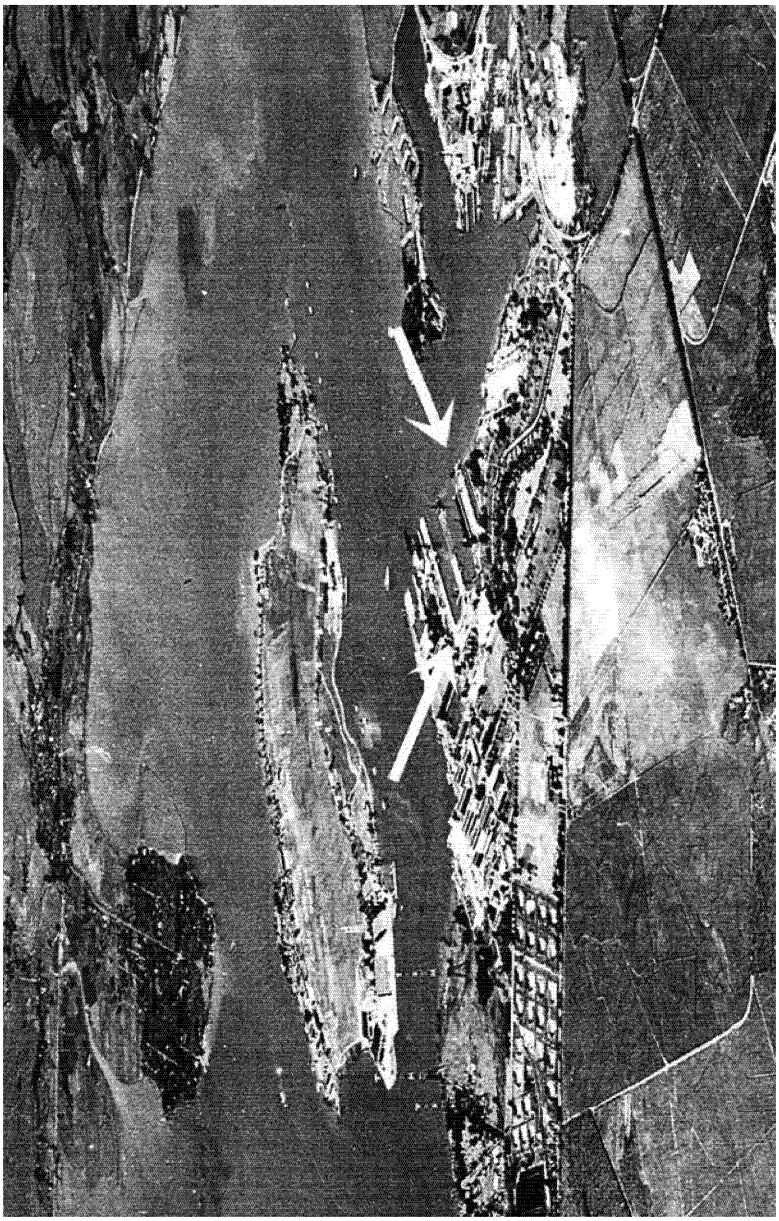


Historic photo dated July 5, 1934 showing pre-cast cylinder bells prior to being sunk to the harbor bottom for wharf foundations. From NARA RG 71 CA 176 E.

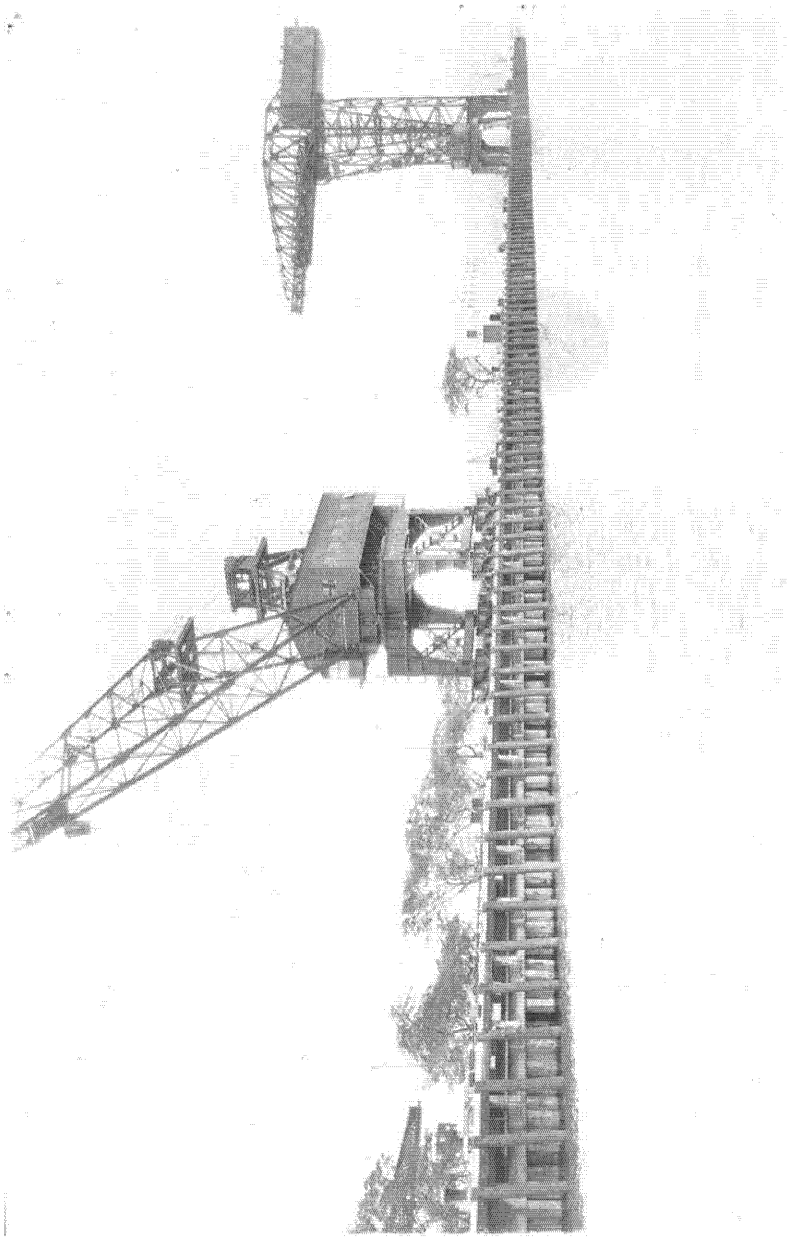


Portion of historic photo dated October 5, 1934, captioned "Pouring Cylinders, Bents #23 and #24. Looking South." The photo date indicates that this work was being done at the west quay wall (B-11/ B-12). The bents that are being poured correspond to the future location of the 200-ton hammer head crane at B-12. From NARA RG 71 CA 176 E.

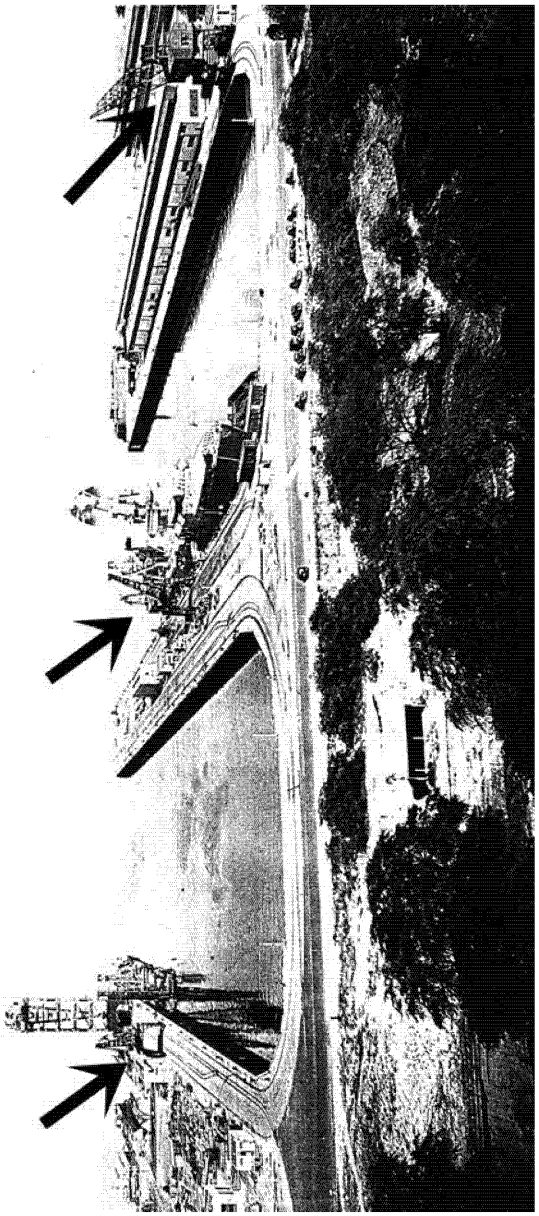
Portion of historic photo dated April 3, 1935 showing construction of the wharfs and piers of Facilites B-11 to B-21 at the repair basins (between added arrows). Note that the middle pier (wharfs B-15 and B-18) appears half completed. View facing north. From NARA, 80 CF 7973-3, "PH # 18324."



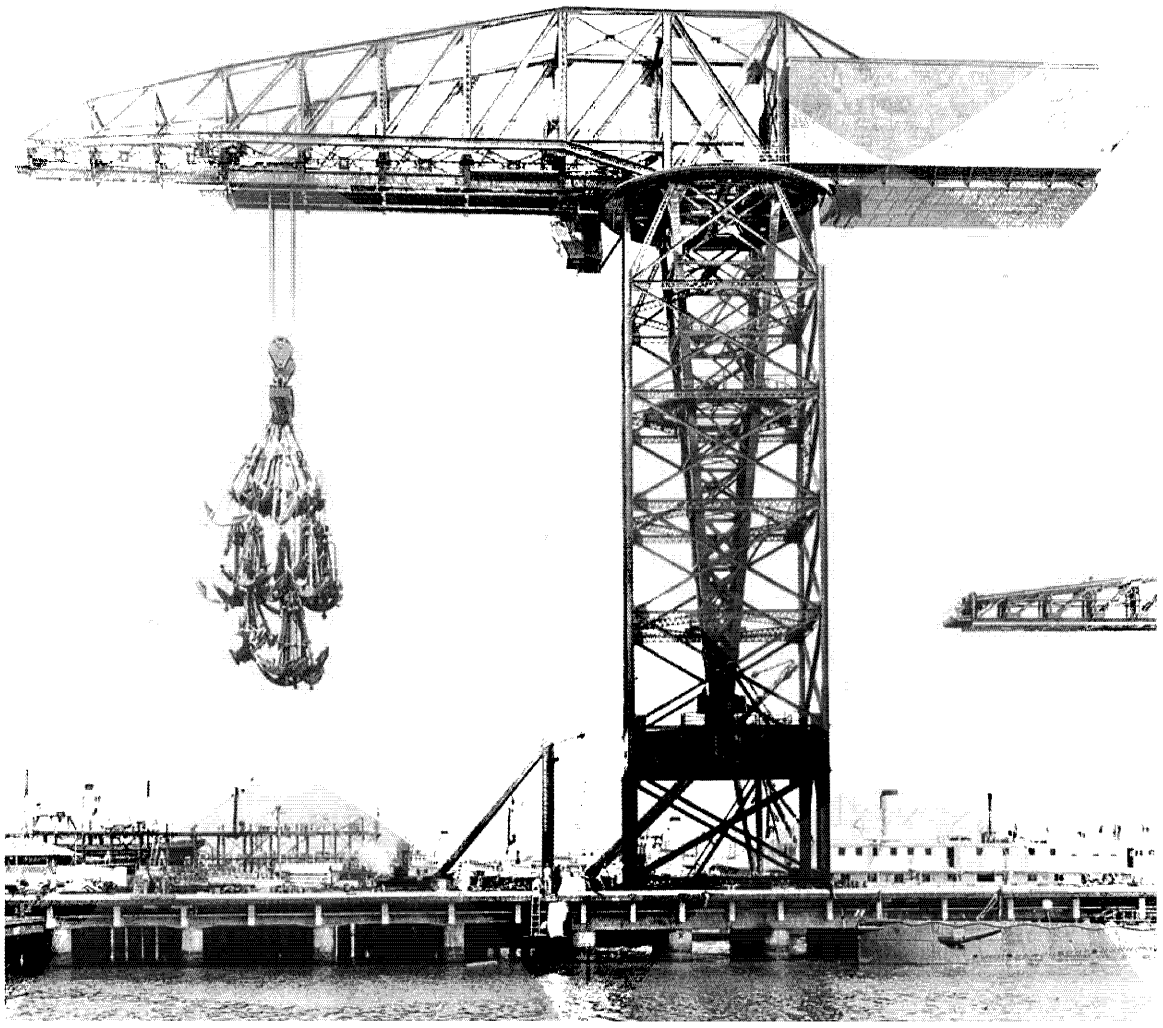
Historic photo dated September 18, 1935 showing wharfs B-13 and B-12 and the 50-ton portal crane (foreground) which ran on tracks and the 200-ton hammer head crane, which was permanently mounted at B-12. From NARA RG 71 CA 176E.



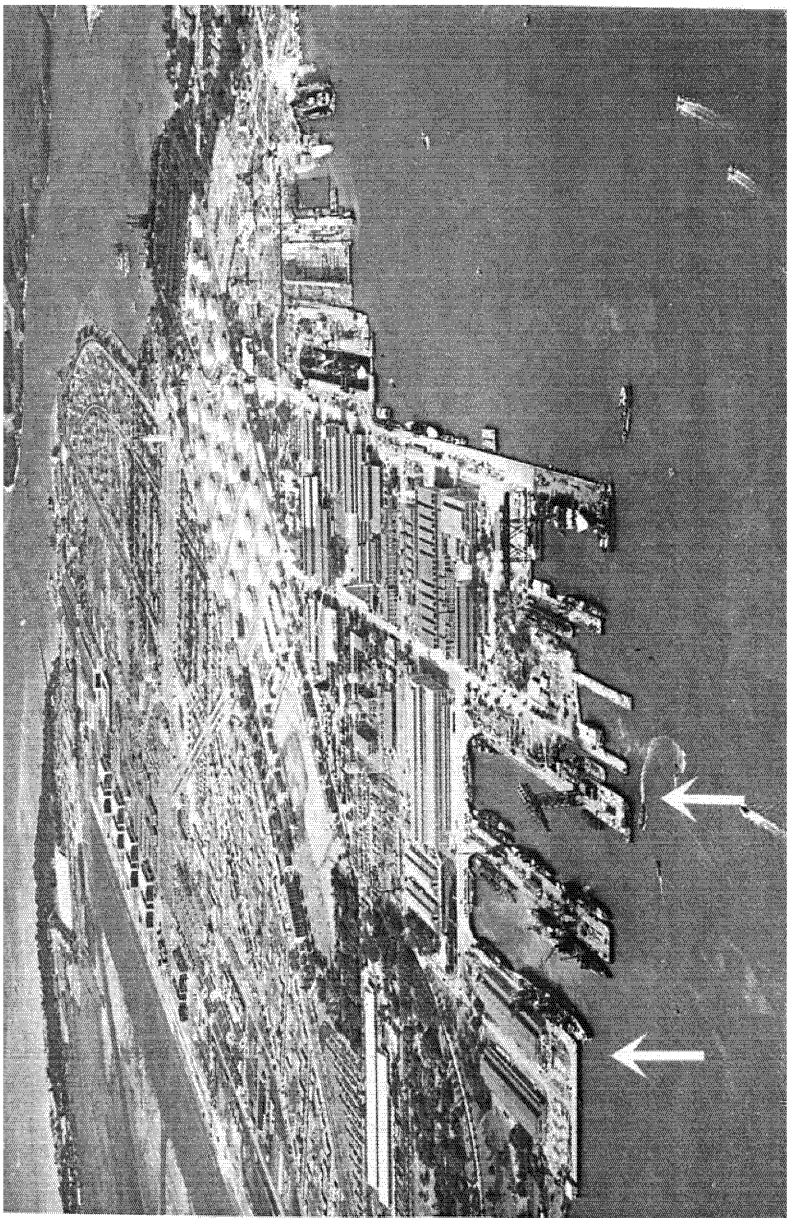
Portion of historic photo ca. 1936 showing the portal cranes (added arrows) and crane tracks at the repair basins. From NARA, RG 71 CA box 166, folder "repair basin folder 2" no photo number, ca. 1936.



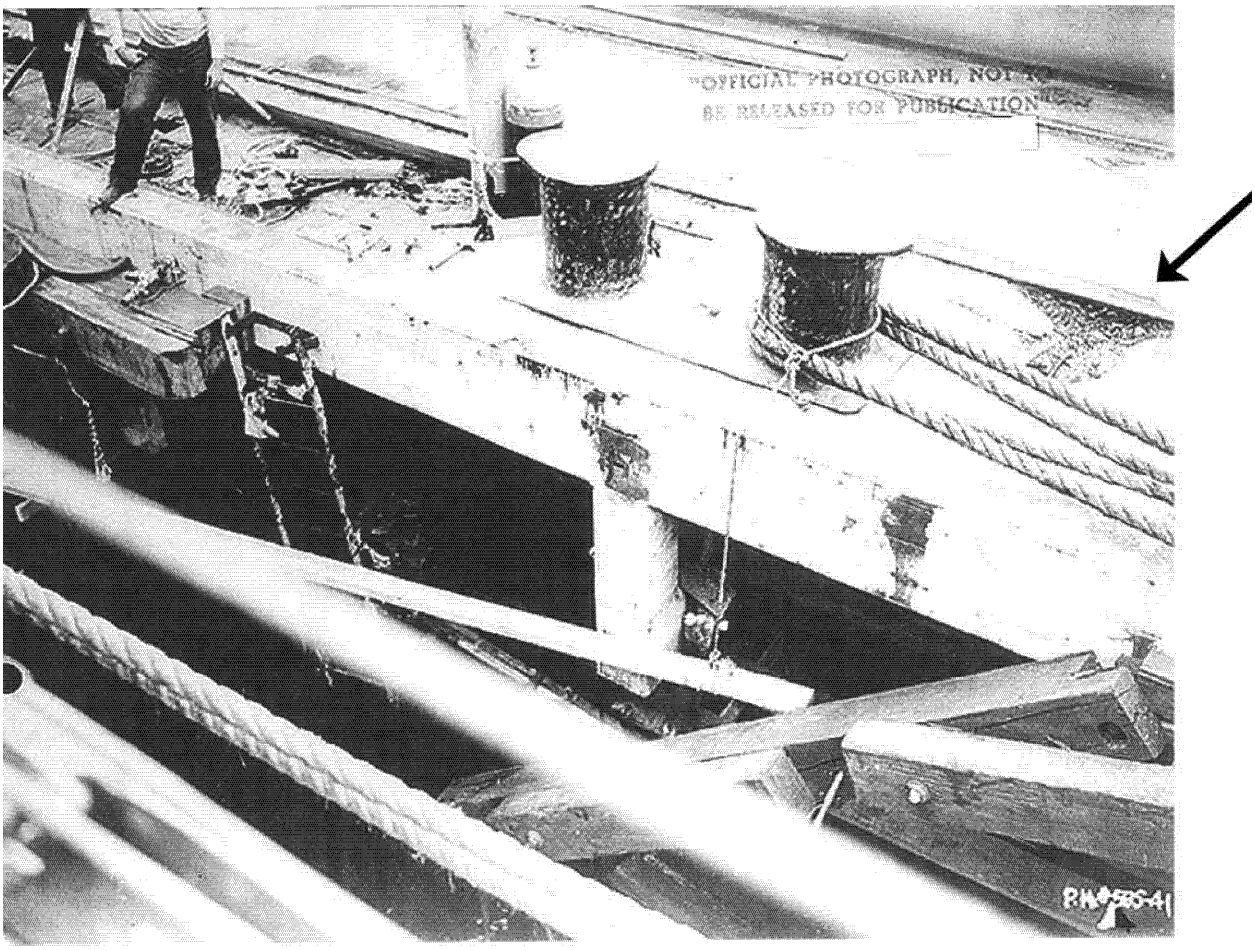
Portion of historic photo dated July 18, 1935 showing the testing of the 200-ton hammer head crane at B-12 with a 125% load consisting of 250 tons of ships anchors. Note the pier construction below the crane – the concrete cylinders have a closer spacing and the concrete beam is thicker than construction at the other portions of the pier. From NARA RG 71 CA 172-B.



Portion of historic photo dated October 13, 1941 showing the completed repair basins and wharfs B-11 to B-21 (between added arrows). Note the 200 ton hammerhead crane at pier B-12 (just above right arrow) and the 1936 extension of the east quay wall at wharf B-21 (just above the left arrow). View facing southwest. From NARA, 71-CA-171B-6, "PH # 115427."

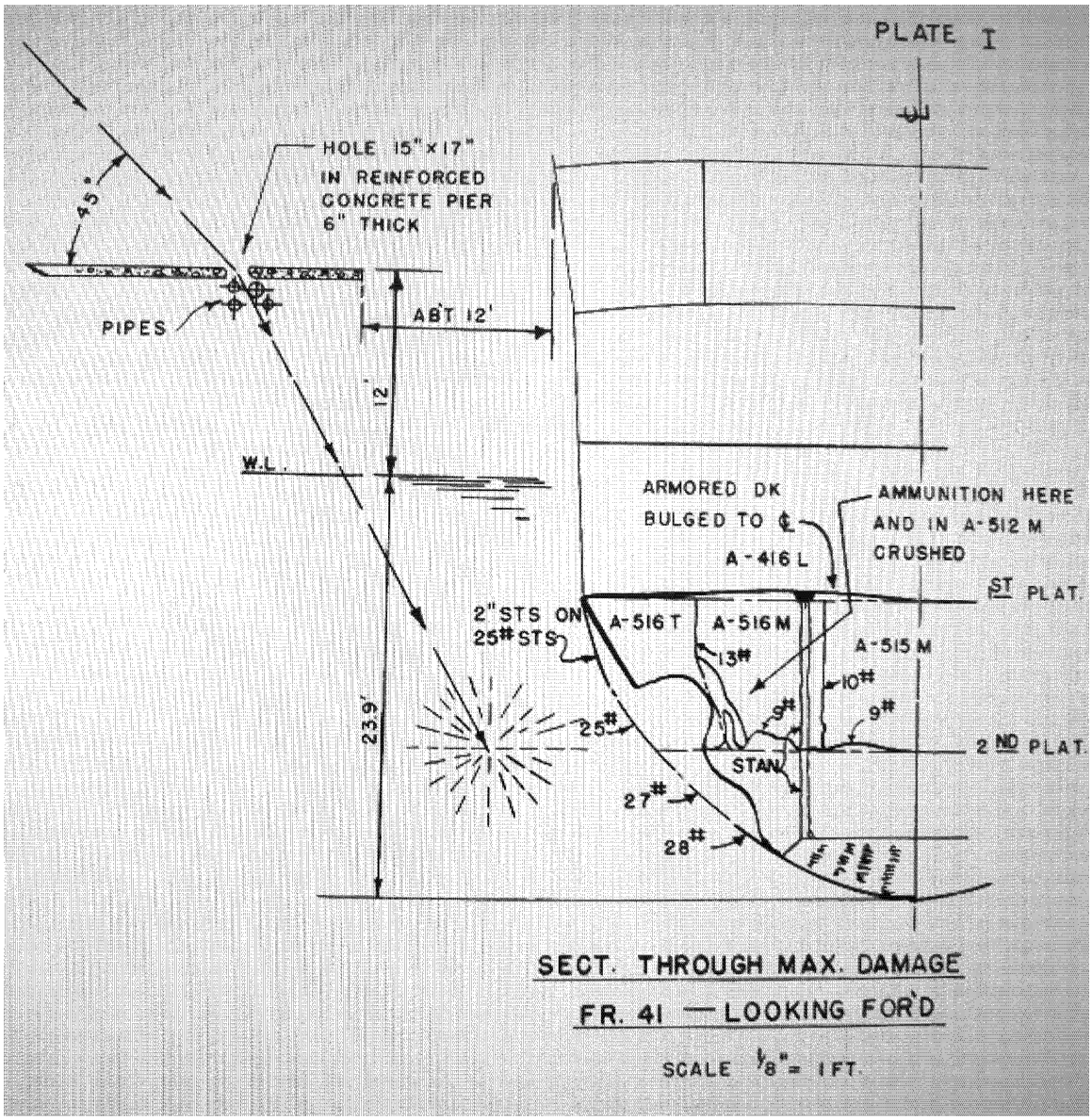


This photo (ca. December 8, 1941) shows the damage to B-21 from the Japanese bomb that detonated near the USS *Honolulu*. Note the location of the bomb hole (indicated by added arrow) next to the railroad track near the mooring bitts at upper right. US Navy photo NH 96661, from Bureau of Ships, US Navy, website: www.dcfp.navy.mil/cgi-bin/WarGallery accessed on December 2, 2009



This photo (ca. December 8, 1941) is a detail that shows the damage to the deck of B-21 from the Japanese bomb that detonated near the USS *Honolulu*. Note the railroad track at the bottom of the photo and the raised curb of the mooring bitts at the top. US Navy photo NH 96664, from Bureau of Ships, US Navy, website: www.dcfp.navy.mil/cgi-bin/WarGallery accessed on December 2, 2009

This sketch (ca. January 1942) shows the path of the Japanese bomb that passed through the concrete deck of B-21 and detonated near the USS *Honolulu*. Note the bomb trajectory at upper left. From Bureau of Ships, US Navy, website: www.dcfp.navy.mil/cgi-bin/WarGallery accessed on December 2, 2009



This sketch (ca. January 1942) shows the location of the damaged area of the USS Honolulu from the Japanese bomb that detonated near it when it was moored at B-21 on December 7, 1941. From Bureau of Ships, US Navy, website: www.dcfp.navy.mil/cgi-bin/WarGallery accessed on December 2, 2009